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MUNICIPAL ENGINEERING

VOLUME XXXIII. JULY, NINETEEN HUNDRED SEVEN. NUMBER ONE.

THE METROPOLITAN WATER WORKS SYSTEM OF MASSACHUSETTS.

THE WACHUSETT DAM.

By Caleb Mills Saville, M. Am. Soc. C. E., Brookline, Mass.

Probably the most widely known of all the works that have been undertaken and constructed for the metropolitan water works is the great dam on the Nashua River at Clinton which has recently reached completion.

The principal dimensions of the dam are:

Height of top of main dam above full reservoir .....20 feet
Height of top of main dam above ground below dam .....114 feet
Maximum height above rock foundation .....207 feet
Maximum thickness at bottom, about .....185 feet
Thickness of dam at full reservoir level .....25 feet
Maximum depth of water above dam .....129 feet
Masonry required for dam, 280,000 cu. yards.

The contract for the construction of the dam was made with MacArthur Bros. of Chicago, Oct. 1, 1900, for $1,603,635.00, and on July 22, 1905, the masonry work was practically completed. At the place where the dam is built the width of the valley at full reservoir level is 1,250 feet. On either side at this point the banks slope quite abruptly to the river. Advantage was taken of the natural configuration of the ground to divide the dam into two parts: the first being the main dam over the valley and the second being the waste weir built along a natural bench on the hillside. Sufficient length is given to the waste weir to discharge a quantity of water equivalent to eight water-shed inches in 24 hours with a depth of seven feet on the crest. The whole dam is built of masonry and founded on rock. The main portion between terminal structures is 850 feet. Passing through the dam embedded in the masonry there are four 48-inch cast iron pipes with their inverts 111 feet below high water in the reservoir. These pipes connect with circular, vertical wells which extend above high water level. Two wells are provided for each pipe and water can be admitted from the reservoir to the down-stream well from various levels and thence to the pipes. The four lines of pipes after passing through the dam enter the lower gate chamber, which is designed to receive machinery for utilizing the power of the water as it falls from the reservoir to the aqueduct.

Every precaution was taken to design not only against possible failure, but also to avoid any suspicion of weakness, and with this in mind, provision was made in the increased thickness for possible stresses from forces not usually considered.

In order, so far as possible, to make a homogeneous structure the dam is composed wholly of rubble masonry with the exception of a thin ashlar facing on the exposed up-stream and down-stream sides.

Large pieces of granite from a quarry opened for the purpose near at hand were used throughout the work except for the facing, which was brought from West Chelmsford, Mass. Both natural and Portland cement mortar were used. All work having to be exposed to the frost from November to April was laid with Portland cement mortar and it was also used in the masonry in the cut-off trench, for masonry immediately above bedrock and in a triangular section of the dam at the deepest part of the valley, having a base of 150 feet extending up stream and a height of about 50 feet. This precaution was taken to provide for the larger stresses when the reservoir is full. The ashlar facing consists of blocks from 12 to 14 inches

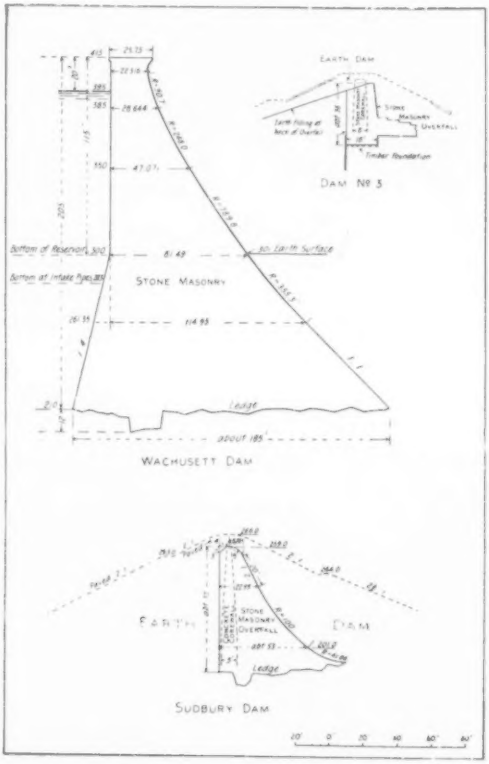
thick, laid with one-half-inch joints. The reason for using this facing on the upstream side was because it would form a more impervious layer than the rubble next the water. On the down-stream side it improved the appearance of the structure and was better able to withstand the action of the frost. This facing is well bonded with the rubble and the slope of the dam on the down-stream face tends to hold it in shape.

The main features of the contractor's plant used in construction were a cable way across the valley, air compressors for the operating of practically all machinery, a railroad about a mile long from the quarry, two large steam pumps and several smaller ones, a 60-ton locomotive and 50 cars of all sizes, besides the multitude of smaller machinery necessary.

After reaching rock the excavation was continued until solid ledge free from seams was found, the average excavation into the rock being 13 feet while the cut-off trench was excavated to an additional depth of 14 feet. To December, 1905, when the work was practically completed, the amount of work done on the principal items was:

Earth excavation	258,600 cu. yds.
Rock excavation	99,350 cu. yds.
Rubble stone masonry	251,921 cu. yds.
Dimension stone masonry	8,816 cu. yds.
Concrete masonry	9,725 cu. yds.

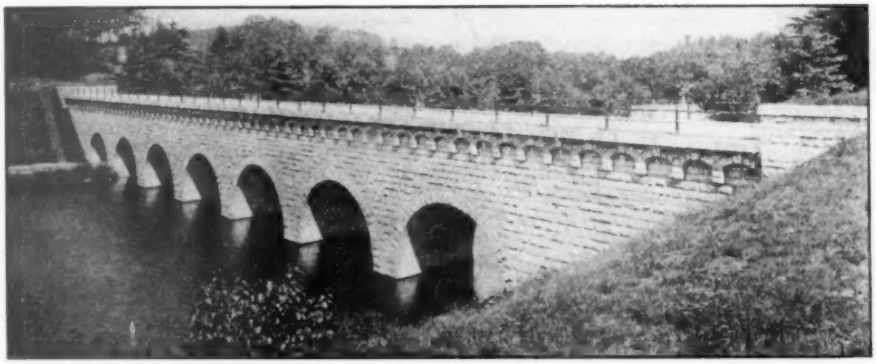
Since the above work began there have been used 81,103 barrels of Portland cement and 182,480 barrels of natural cement. All of the natural cement has been of the Union brand and a large part of the Portland cement of the Giant brand.



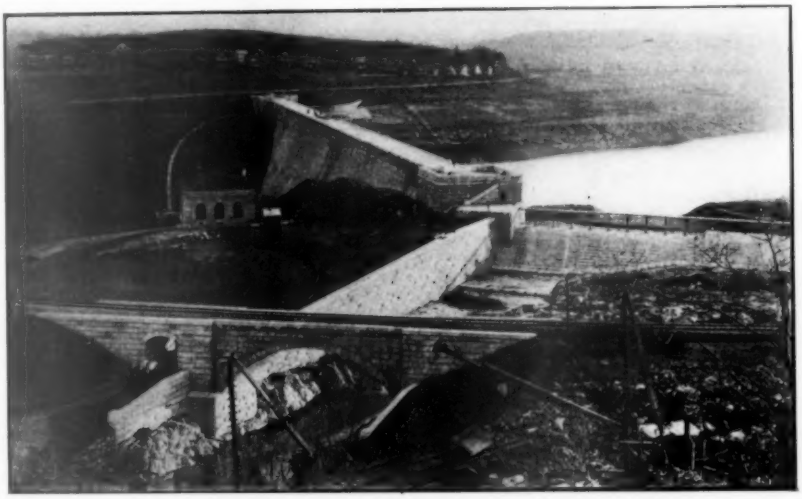
CROSS SECTION OF DAMS

Massachusetts Metropolitan water supply.

The largest amount of rubble masonry laid in any week was that for the week ending June 25, 1904, when 11 derricks were in operation and 3,459 cubic yards were laid. The average amount of rubble masonry laid per day by each mason was 13 cubic yards, and by each derrick 56 cubic yards. The maximum force employed by the contractor was 778 men and 54 horses.



BRIDGE OVER ASSABET RIVER, CARRYING CONDUIT,
Massachusetts Metropolitan Water Supply.



WACHUSETT DAM, CLINTON, FROM THE NORTH,
Massachusetts Metropolitan Water Supply.

The North Dike, so called, on the northerly side of the reservoir, is interesting as a bold piece of engineering work conceived to utilize existing conditions to the utmost. This dam has a length on the water side of two miles, a height to full reservoir in the deepest part of 65 feet and a maximum width at the base of 1,930 feet. The area covered by it is 143 acres and 5,000,000 cubic yards of material excavated in stripping the reservoir were used in its construction. To secure watertightness a cut-off trench about 9,500 feet long and 30 feet wide at the base, with 1 to 1 side slopes, was dug parallel with the reservoir line, through coarse sand and gravel to rock or until a very fine sand nearly impervious to water was found. This excavation reached to depths of from 30 to 60 feet. In the bottom of the trench for about a mile, where rock was not encountered, sheet piling, generally 6 inches thick, was driven to a maximum depth of 62 feet. The soil from the reservoir stripping was deposited in 6-inch layers in this trench and in the embankments above for a width of 100 feet and thoroughly watered and rolled with heavy grooved rollers.

Where the dike is exposed to waves it is paved with a belt of heavy rip-rap 18 feet wide. On the south side of the basin the construction is similar, but the ditch is only about 2,800 feet long.

Up to January, 1906, the cost of the Wachusett Dam, exclusive of engineering work, was $2,182,644.42. Some idea of the size of this dam and reservoir may be had by comparison with others of the largest works for similar purposes here and abroad.

Name—Location.	Material.	Maximum length, ft.	Max. height above rock. feet.	Volume masonry, cu. yds.	Res. Cap. million cu. ft.	Cost.
Wachusett—Mass., U. S. A. (w)	Rubble	1,250	207	280,000	8,400	$2,200,000
Croton—N. Y. (w)	.....	1,270	225	833,000	4,000	7,600,000
Sudbury—Mass. (w)	.....	1,865	70	.....	1,000	650,000
*Swift Run—Mass. (w)	.....	2,470	144†	.....	54,000	.....
Roosevelt—Arizona (ir.)	Rubble	644	280	350,000	61,000	2,000,000
Pathfinder—Wyoming (ir.)	Rubble	226	210	53,000	43,600	600,000
Shoshone—Wyoming (ir.)	Rubble	175	300	69,000	20,000	700,000
Vyrnwy—England (w)	.....	1,350	129	.....	1,950	.....
Nira—India (ir.)	.....	3,000	100†	.....	5,500	.....
Tansa—India (ir.)	.....	8,770	131	.....	5,000	.....

*Proposed for future water supply of Metropolis Dist. (w) Water supply.
†Above ground. (ir,) Irrigation.

—The Clinton Sewerage System.—

One of the first steps toward the construction of the Wachusett Reservoir was the construction of a sewerage system for the town of Clinton, which up to that time had discharged its sewage into the Nashua River just below the site of the dam. The plans finally adopted provided for an intercepting sewer along the river bank about a mile and a quarter long, discharging into a concrete receiving basin holding about 600,000 gallons. Adjoining this reservoir is a pumping station for raising the sewage about 50 feet through an 18-inch cast iron force main about a half mile long to a series of 25 filter beds. From these the effluent is discharged by gravity into the river below the dam.

The contract price for the filter beds was	$19,022
For the intercepting sewer	34,016
For a 3,000,000 gal. pump and engine	6,200
For a pumping station	5,500
Total cost	$64,738

—The Wachusett Aqueduct.—

On account of the threatened scarcity of water for the Metropolitan District in 1895, it was felt that every energy should be directed first, toward increasing the then available supply, even to the extent of constructing temporary works. On this account the building of the Wachusett (then called the Nashua) Aqueduct from the proposed dam at Clinton to the Sudbury Reservoir was the first work undertaken. This work was pushed along so rapidly that in March, 1898, about two years after the letting of the first contract, the aqueduct was ready for use. Starting from the lower gate house at the dam the aqueduct is 12 miles in length to the Sudbury Reservoir. It is built partly in tunnel, partly in cut-and-cover conduit, and partly in open channel.

Its lined portion is of horse-shoe

section, varying in size according to the nature of the ground passed through, its standard form in earth excavation having a center height of 10.5 feet and a maximum width of 14.5 feet. Its capacity in all sections is estimated at 300,000,000 gallons per day.

From the dam at Clinton for two miles through a high hill the aqueduct was built in tunnel. About one mile of this construction was through rock so compact as not to require any lining, while the remaining portion was faced with brick. Throughout the entire length the floor is of brick and has a fall of 1 foot in 5,000 feet.

For about seven miles the aqueduct runs through a comparatively level country and is built by what are termed "cut and cover" methods. This portion has a fall of 1 foot in 2,500 feet. The maximum height where in embankment is 36 feet and in cut the excavation reached a maximum depth of 43 feet. This section is built of concrete and lined with brick.

Where the conduit crosses the Assabet River, a stream about 200 feet wide, it is carried on a granite masonry bridge 360 feet long, consisting of seven arches, each having a span of about 30 feet. To prevent leakage from the aqueduct at this point and the consequent damage by frost, the conduit was lined throughout with sheet lead. The remaining three miles to the Sudbury reservoir the aqueduct is in open channel. This portion was built with a bottom width of 20 feet and side slopes of three horizontal to one vertical. In order to prevent erosion of the bottom and sides of this channel, they were faced with gravel when necessary and two regulating dams were constructed; one, half way in the length of the channel, the other at its end at the Sudbury reservoir. The superstructure on the aqueduct consists of two granite buildings, one a covered gaging chamber, the other the terminal chamber at the end of the covered masonry aqueduct. The cost of this work to January, 1901, was

	Total cost.	Cost per mile.
Tunnel	$342,006	$171,003
Masonry conduit	859,466	122,638
Terminal chamber	8,642	.....
Assabet bridge	66,240	.....
Open channel	170,050	56,683
Preliminary and engineering work	166,178	.....
Real estate and legal	164,730	.....
	$1,777,312	
Addition and incidental to Jan., 1906	16,288	
Total cost	$1,793,600	

TILE FLOORS.

By C. J. Fox, Ph. D., Washington, D. C.

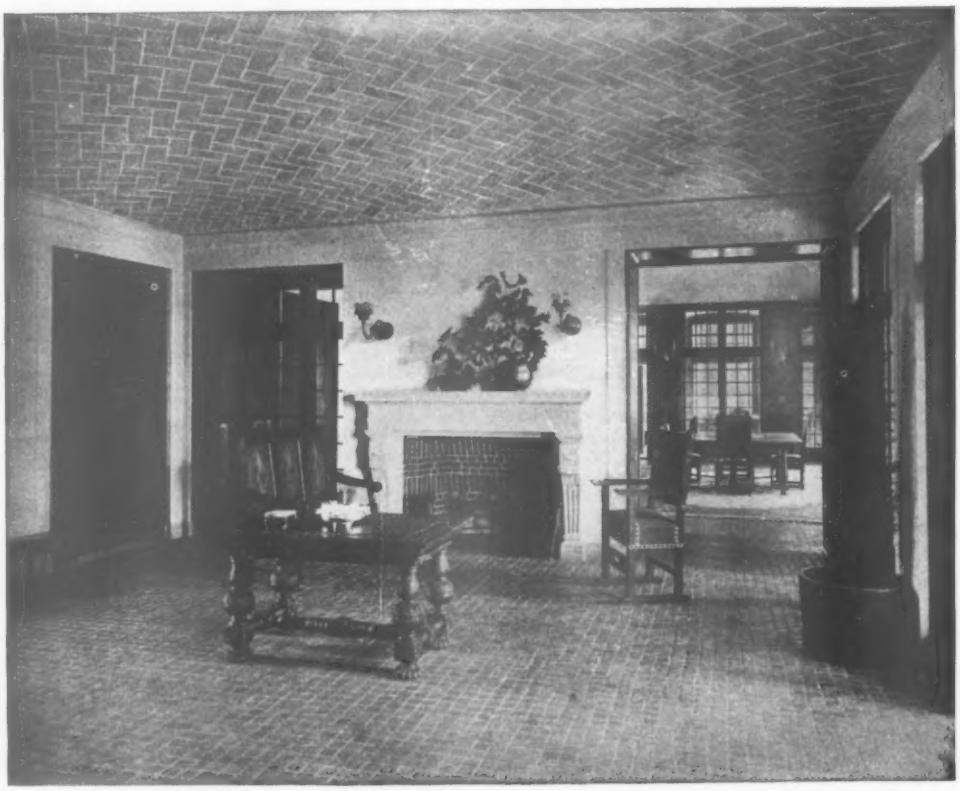
A European traveling in this country once remarked that although America was the land of comfort, luxury and modern convenience, the people neglected even the laws of common decency in their utter disregard for things under foot. He referred to the unpaved and dirty streets until within a few years so very common in our cities; and to the worn and unsanitary floors so common in many of our finest houses. In the matter of streets we have made considerable progress, and have in fact almost caught up with our European critics, but in the matter of flooring we have still considerable to do. America is even today the land of carpets, those highly unsanitary coverings for dirty or worn floors. A carpet is no doubt pleasant to walk upon, and it suggests warmth, but unless it is removed and thoroughly cleaned ten times more often than is done by the best of housekeepers, a carpet is a positive source of danger from its unsanitary condition.

Not only in our private houses but in our public buildings, such as schools, churches, hospitals, stores of all kinds, libraries, etc., we find far less attention given to the condition of the floor than to any other part of the building. America is rich in wood, and this fact has led to the general adoption of wood as a flooring material, while as a matter of fact it is in many ways the most unsuitable covering for floors in any place that is subject to hard and constant usage, and to frequent soiling from our street dirt or other vegetable or animal matter. Wood itself absorbs dirt and moisture, which causes it to decay and become the breeding place of countless numbers of infectious and bad-

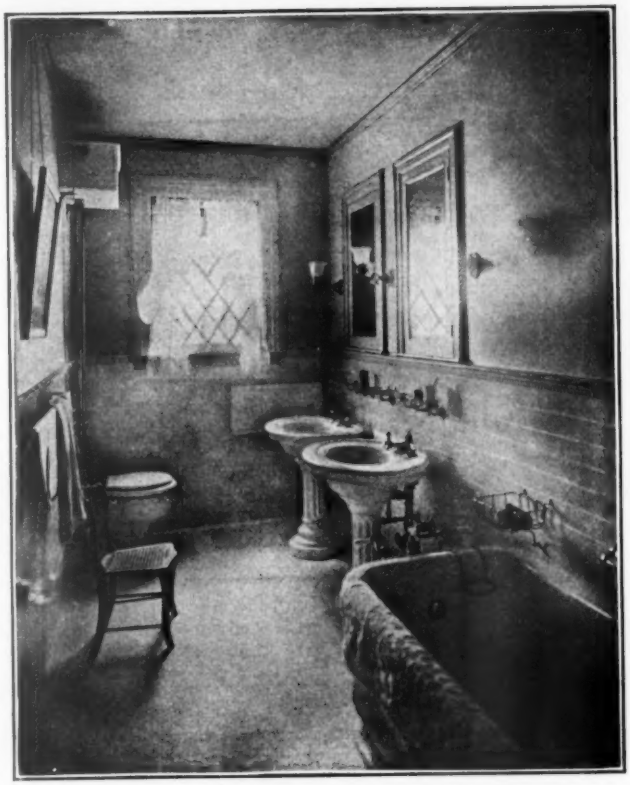
smelling micro-organisms. The musty odor characteristic of our older houses, no matter how well they are cleaned, and that peculiar and indescribable odor called the "institute smell," noticeable in many of our finest hospitals, schools and other institutions, are due solely to the fact that the wooden floors of these buildings have been for years absorbing filth of all kinds, which breed the anaerobic and other germs, not only in the cracks of the floor but in the wood itself. These germs live far beyond the reach of soap and water; or rather they thrive on the dampness which frequent washing of the floors brings about. In our modern houses we should avoid the wooden floor above all places in the bath-room, kitchen, butler's pantry, laundry and vestibule.

Marble is a good flooring material, but it is easily scratched and worn by the steel nails of the shoe; is rather porous; is stained by ink and acid and is likewise expensive. Rubber floors are agreeable to walk upon, but they have a disagreeable odor, especially in a hot room, and they cover up much dirt which works its way under them. The rubber interlocking so-called tile is highly unsanitary owing to the fact that the joints are not filled with cement.

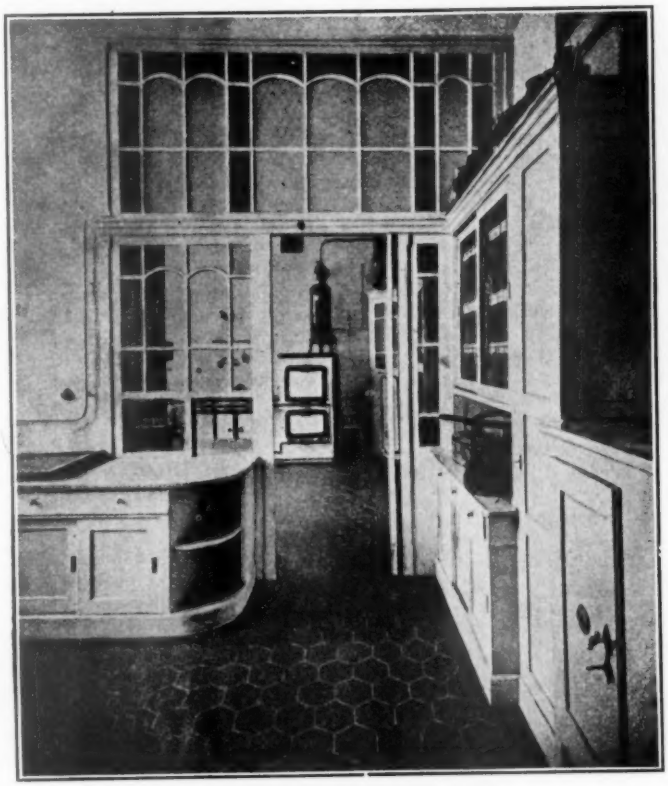
The ideal floor covering is beyond all question the baked clay tile or the ceramic mosaic. Baked clay is harder than marble, slate, or any natural stone. Clay tiles last for hundreds, even thousands of years. They are non-porous and can not absorb dirt or moisture. They are easily kept clean, and are absolutely germ proof. Even the joints between them are completely filled with a very hard antiseptic cement, as non-porous and germ proof as the tile itself, while the hardness of the tile prevents the cement in these joints becoming worn. Baked in the very hottest of fires the clay tile is of course fireproof. All that has been said of the clay tile ap-



A HANDSOME TILE FLOOR.



TILE FLOOR IN A BATHROOM.



A TILE FLOOR IN A LABORATORY.

plies with equal force to the ceramic mosaic which is really nothing more than diminutive tile laid out in artistic or pictoral designs. Although the structural and sanitary properties of the tile are important, its artistic possibilities are equally significant. Clay tile can be made in an almost unlimited number of colors, designs and shapes. In this respect it is far superior to marble.

These valuable properties of the clay tile as a floor covering make its use in the modern dwelling house of utmost importance in the bath-room, kitchen, butler's pantry, laundry, and in the vestibule. Likewise in the fire-places and hearths. The large amount of dampness and animal and vegetable matter which is unavoidably spilled upon the floors of the bath-room, kitchen, butler's pantry and laundry make the use of tiling or some other non-absorbent, inorganic floor a hygenic necessity. The rough usage to which the vestibule is put, and the amount of street dirt which is deposited upon it, make it necessary that this also should be of tile. The wear and tear of fire-place and hearth due to knocks and blows of poker, tongs and coal hod, and to the ashes and hot coals make the use of tile a necessity here also; not to mention that as a fire resisting and warm appearing substance, clay tile is the most appropriate material for the fire-place, mantel and hearth.

The same demands for cleanliness and durability, not to mention the artistic effect, make the use of tile flooring imperative in hospitals, railway stations, churches, public buildings of all kinds, stores, especially butcher shops and dairies, and any other places that are subject to much traffic.

Tile are the cleanest, most attractive, the most durable and consequently the best of all the known flooring materials.

CONCRETE DWELLINGS.

PRIZE DESIGNS FOR CONCRETE HOUSES.

By Louis H. Gibson, Architect, Indianapolis, Ind.

The judgment of the committee of experts on competition designs for suburban dwellings in concrete, in the competition organized and carried to a successful consummation by the Association of American Portland Cement Manufacturers, indicates a great step in advance in the matter of the design of concrete structures. With designs of the character which this competition has developed, there need be no further question in the minds of the people who build or those who manufacture as to the possibilities of concrete design or block construction. In the minds of those who have hitherto given this question serious consideration, there never has been any question, but people who build are influenced by what they see, and are not disposed to reason very far in a matter of this kind. When people see at every turn cement block houses that are ugly they are disposed to associate cement block construction with ugliness. It was for the purpose of indicating what could be done by capable artists that the competition for suburban dwellings in concrete was instigated by the Association of American Portland Cement Manufacturers.

This competition emphasizes the fact that beauty costs no more than ugliness. This proposition has been made again and again in the pages of this Magazine, and it will continue to be made. The large part of the value of any structure is not the raw material that goes into that structure, but the thought. It is thought that lends value to raw material. If we could carry this statement along with us in the consideration of these designs and others, and in connection with any work that we do, we would add much more largely to the world's wealth than we are now doing, and add greatly to our individual efficiency in everything that we touch. It is material plus thought which makes value.

In selecting the designs for publication there is no thought to express a preference or to bring into question any of the work of the committee of judges or the sum of approval which comes from the work of the association.

Design No. 178 has a cleverly ar-

A TILE FLOOR BEFORE THE FIREPLACE.

A TILE FLOOR IN A LABORATORY.

ranged floor plan, simple in outline, logically set forth. We are pleased to publish this design because of its simple character, its simple outline in plan and in elevation. One can see buildings of this general form made very ugly in execution merely on account of a disregard of detail and a lack of refinement and seriousness in their execution. Here is practically a square plan, not greatly different in many respects from many double houses, yet greatly different in design because of its beauty. The beautiful house is the rare house. The exterior of this building, admirably composed as it is beautiful in its conception, is relatively inexpensive in its dispositon and arrangement of materals.

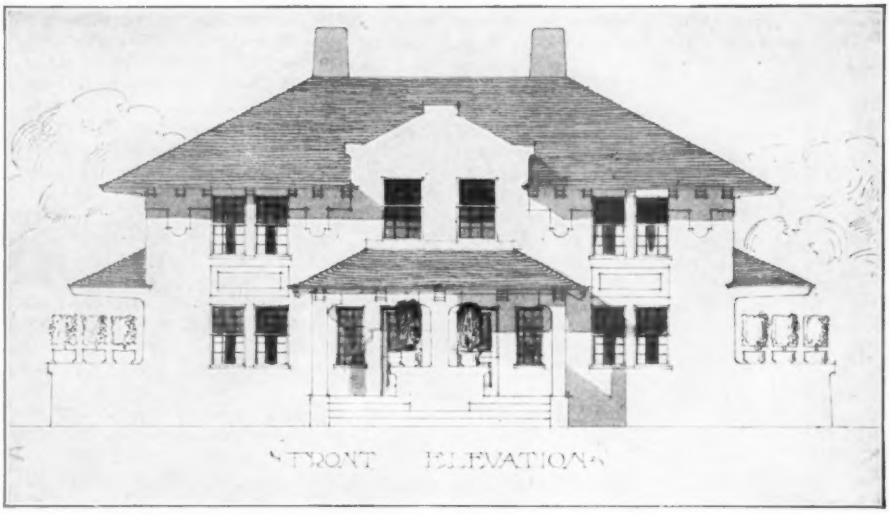
The author of this design is Mr. Andrew Lindsay, of New Rochelle, New York. It was awarded first prize in the B2 class. The estimated cost of this structure is $5,895. The author suggests that the foundation walls up to the first floor beams, the entrance porches, verandas, balustrades and posts be all monolithic concrete, cased in the usual manner in wood forms, and that the upper walls be built of hollow concrete blocks, with a bush hammered surface. He also suggests that the roof brackets be concrete cast in wood mold, and that the soffit of roof projection be plastered with the cement on metal lath. The author also suggests that the exterior walls be light gray in tone and that the shingles on the roof be stained silver gray.

Design No. 158 is of a detached structure and is a representation of the modern spirit in house-building. A few years ago many of us had it in mind that no matter how inexpensive we were building we should at least imitate in a feeble way the pretentious structures of the people of great wealth; that there should be the parlor and sitting-room, the dining-room and the kitchen, sometimes the music-room, and, if not, a den on the first floor. Even in moderate cost houses, representing only a few thousand dollars, this division and subdivision, this affectation of sumptuousness on a cheap scale, was common. Here is a little plan with a splendid living-room, which is also used as a dining-room, and communicating kitchen, splendid fireplace, conveniently arranged hall and a picturesque disposition of utilities which would make a very delightful home, and one which could be economically maintained. The fireplace hearth is raised slightly above the living-room and the hall floor, and there is a seat at one side of the fireplace—altogether a very charming arrangement. The location of the stack is such that only one chimney is necessary for the accommodation of all the rooms. The exterior indicates a simple, refined, carefully considered piece of work, which will reflect credit not only to the designer, but also to those who have the good judgment and common sense to build and live in such a house. The estimated cost is $1,955. The outside walls and porch posts are to be of monolithic concrete, the cellar and porch floors are to be of concrete.

The author of this design is Mr. Eugene Ward, Jr., of New York City. It was awarded first prize in the A1 class.

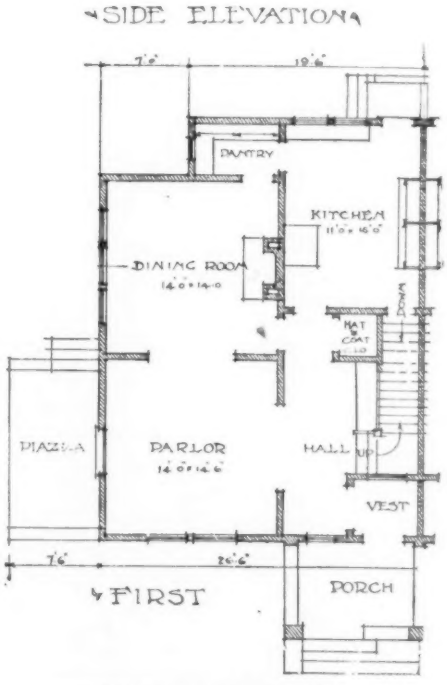
Design No. 91 is a concrete block design, beautifully rendered and with an interesting suggestion as to its surroundings. It is one of the simplest compositions and one of the most picturesque of the group. This design won the first prize in the A2 class. In these days, when the household labor is one of the great labor problems of our time, it behooves us to consider what the architect may do to make the work of the housekeeper easy. It is not only a question of paying for service, but also a question of weariness at the end of the day because of the housekeeper's ambition to do an impossible amount of work every day. This is a house plan not only economical structurally, but economically arranged with respect to the work of the housekeeper. The living-room is just as beautiful because of its design as if it were in a house that costs $100,000—and, by the way, money makes more houses ugly than it does beautiful; money often gives the crude man or the crude woman an opportunity to express in a material and monumental way a crude and ugly attitude. The man or the woman may die, but the house continues to exist.

Design No. 102 is another one of the semi-detached structures—that is, a double house, and is priced at $4,000. It is naturally to be assumed that these houses cannot be built for the same price all over the country; it is a question of locality and a question of business. This is one of the very beautiful designs, and at the same time, like many other beautiful things, it is relatively simple. There are many double houses in every city of about this same outline on the exterior, and most of which are woefully ugly. This artist has taken this relatively simple motive and made a thing of beauty. Now, this beautiful house will not cost as much as many of the ugly houses which all of us know.



CONCRETE DWELLINGS.

No. 178. First Prize for double house not exceeding $3,000.
ANDREW LINDSAY, New Rochelle, N. Y., Architect.



CONCRETE DWELLINGS.

No. 178. First Prize Class B1.

This design is by George S. Idell, Philadelphia, Pa. It received the second prize in B1 class.

The increased cost of living, the higher prices of food and clothing, etc., have a direct effect on the housing question. Only a very small proportion of the people can afford to pay the price for domestic service, and as there is no reason to expect material relief, the conditions will have to be met in two ways—one by altering our method of living, and another is to consider the question of the arrangement and construction of houses from the standpoint of the engineer. We must now build with the new labor problem clearly in mind, realizing that much of the building we have done has little or nor value as an investment, because it is so expensive to live in such structures. The domestic labor problem has assumed a broad, economic significance, the demands on the housekeepers are increasing, but up to this time no skilled engineer or trained professional has given his time, thought or energy to laying out completely organized plans to save labor and expense in housekeeping. This is the new profession—that of the Housekeeping Engineer. The floor plans which have been developed in connection with this competition will be greatly helpful in this direction. There is more waste of energy and money in household labor than any other industry. Household engineering is a problem not only for the individual, but for the municipality, the city and the country at large. Economy in living is related to the economy of production.

MUNICIPAL PROGRESS IN PADUCAH, KY.

Although Kentucky has but two cities within the 30,000 limit, according to the estimated population of the census bureau for 1904, there is no doubt that on the most conservative basis Paducah should be added to this list. The last directory census indicates that it has a population of a little more than 30,000. Its growth has not been of the mushroom order, but rather steady and substantial, which augurs more lasting results for the community. Located in the western part of the state, where the soil is less fertile than in the east, it is nevertheless destined to become a healthy manufacturing center, because it is on the Ohio river at the junction of the Tennessee, the waterways, with its railways, furnishing excellent transportation facilities.

The development of Paducah as a city has come within the last twenty years, and its principal improvements have been brought about by the wise leadership of Dr. David A. Yeiser, who has been its mayor during the greater portion of that period.

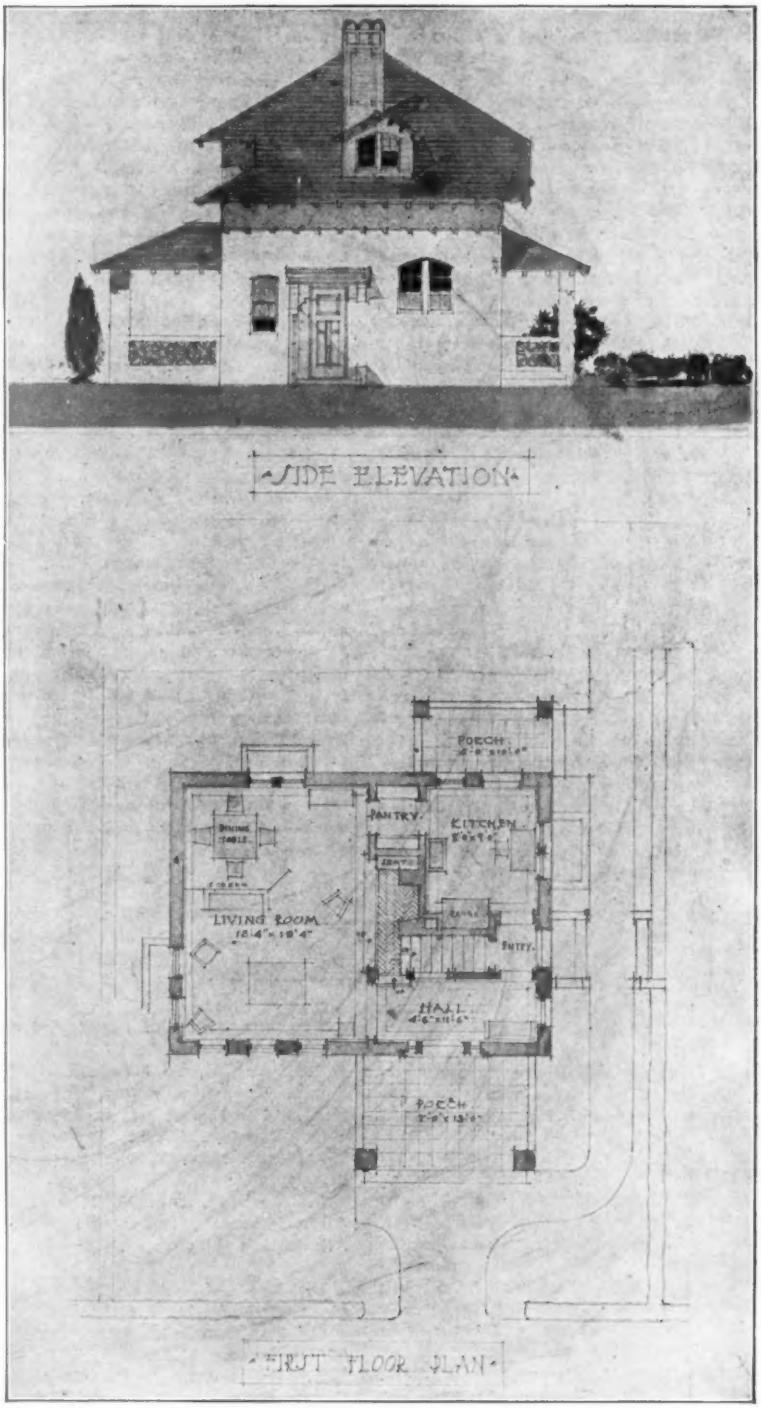
When he was first elected mayor of the city of Paducah, the city had poorly paved streets, no sewer system and no public improvements to speak of.

The most rapid growth in population has been during the last five years, and, while the population has increased, the death rate has decreased from 630 in 1901 to 483 in 1905.

Ten years ago Mayor Yeiser obtained sufficient funds to build a small electric lighting plant to light the city streets. This has been in successful operation and has reached a point where it is desirable to enlarge it, so as to light all public buildings with incandescent service, and later to add commercial lighting.

This plant originally cost less than $25,000, including house, grounds, poles, wires and apparatus. The average cost per arc lamp per annum, including all extensions and repairs, has not exceeded $55.00. The necessity for the reconstruction of the plant is generally conceded. It is already carrying a larger load than is expedient, so much so that it is liable to a breakdown at any time. During the past year it has been compelled to refuse applications for new lights, and at this time there should be at least fifty new arc lamps installed to properly illuminate the different parts of the city. A sum of $14,000 to $18,000 would equip the plant for the added service required during the next ten years.

Twenty-two years ago the city granted a franchise to a private water company for the installation of a water system, securing its supply from the Ohio River. The service of this plant up to the present time has met all requirements and has been remarkably good. A new agreement with the company will give a large reduction in the price charged per hydrant for fire protection service. The company offered to reduce the charge per hydrant from



CONCRETE DWELLINGS.

No. 158. First Prize for house not exceeding $2,000.
EUGENE WARD, JR., New York, Architect.

$40.00 to $20.00 for the next ten years, and for the subsequent eight years to charge but $15.00 per hydrant per year. This agreement does not interfere with the purchase of the entire plant at the end of any five-year period. The service is low-priced for the domestic consumer, as the minimum charge amounts to $3.50 per annum for a single tap.

A few years ago a sewerage system, necessarily limited to one district, was put in. This is now in process of extension, and one or more districts will be added in the near future. This will add to the healthfulness as well as the cleanliness of the city, and will be of real commercial value to the entire population. The extension of a sanitary sewer system, so as to include the entire city, is desirable both for residential and manufacturing purposes.

During the past year the city has completed a new market house, which has been a benefit to the entire community. It has met with universal public approval. The charges are from $25.00 to $120.00 a year for the different stalls, according to the location. It is in charge of a competent market master, who has it thoroughly cleaned every day, and as its floor is made of concrete, this can be easily done. The receipts for 1905 from the market house rentals amounted to $4,730.00. It is well lighted and well adapted for its use in every particular.

A city hospital has recently been constructed, which is up-to-date in every particular and ample in its proportions to take care of the increasing patronage for the next ten years.

In the near future the citizens of Paducah will have an opportunity to vote upon the proposition for the creation of a park system. This will involve the purchase of some large tract of ground as near the center of the city as practicable, and small squares for a system of small parks. The question of boulevards will also be given consideration.

The fire, police and health departments are well organized, well equipped and efficient in their several fields.

The most urgent public necessity has to do with streets. The city has 46.9 miles of graveled streets, which are in fairly good condition, although they are extremely dusty, and therefore offensive in dry weather. There are about three miles of brick streets and about a third of a mile of bitulithic or tar macadam pavement.

All of the permanently paved streets are thoroughly cleaned once a day in some localities, and two or three times a week in others, with a sanitary flushing machine. This keeps them free from dust, and has proven a most satisfactory method of cleansing them. In addition to this service, there is a light patrol system for several of the business streets, which includes the man with the broom and can to pick up horse droppings and the other litter of the streets.

BOOKS FOR ENGINEERS.

The list of books for Engineers begun in the April number of MUNICIPAL ENGINEERING is continued. Suggestions of additions, corrections and changes are invited from our readers for insertion in a supplementary list.

DYNAMO ELECTRIC MACHINERY (Continued).

C.D. Hanchett, George T. Modern Electric Railway Motors. Net, $2.00. A discussion of current practice in electric railway motor construction, maintenance and repair. The object of the book in short is to show how electric railway motors are made today and why they are so made.

D. Hawkins, C. C., and Wallis, F. The Dynamo; Its Theory, Design and Manufacture. With four hundred and thirteen illustrations. Net, $3.00. A detailed discussion of the theory, design, construction and operation of dynamos for the generation of direct and alternating currents.

A. C. Houston, Edwin J. Electro-Dynamic Machinery for Continuous Currents. Illustrated. Net, $2.50.

C. Houston, E. J., and Kennelly, A. E. Alternating Electric Currents. Net, $1.00.

D. Jackson, Dugald C., and Jackson, John Price. Alternating Currents and Alternating Machinery, Illustrated. Net, $3.50.

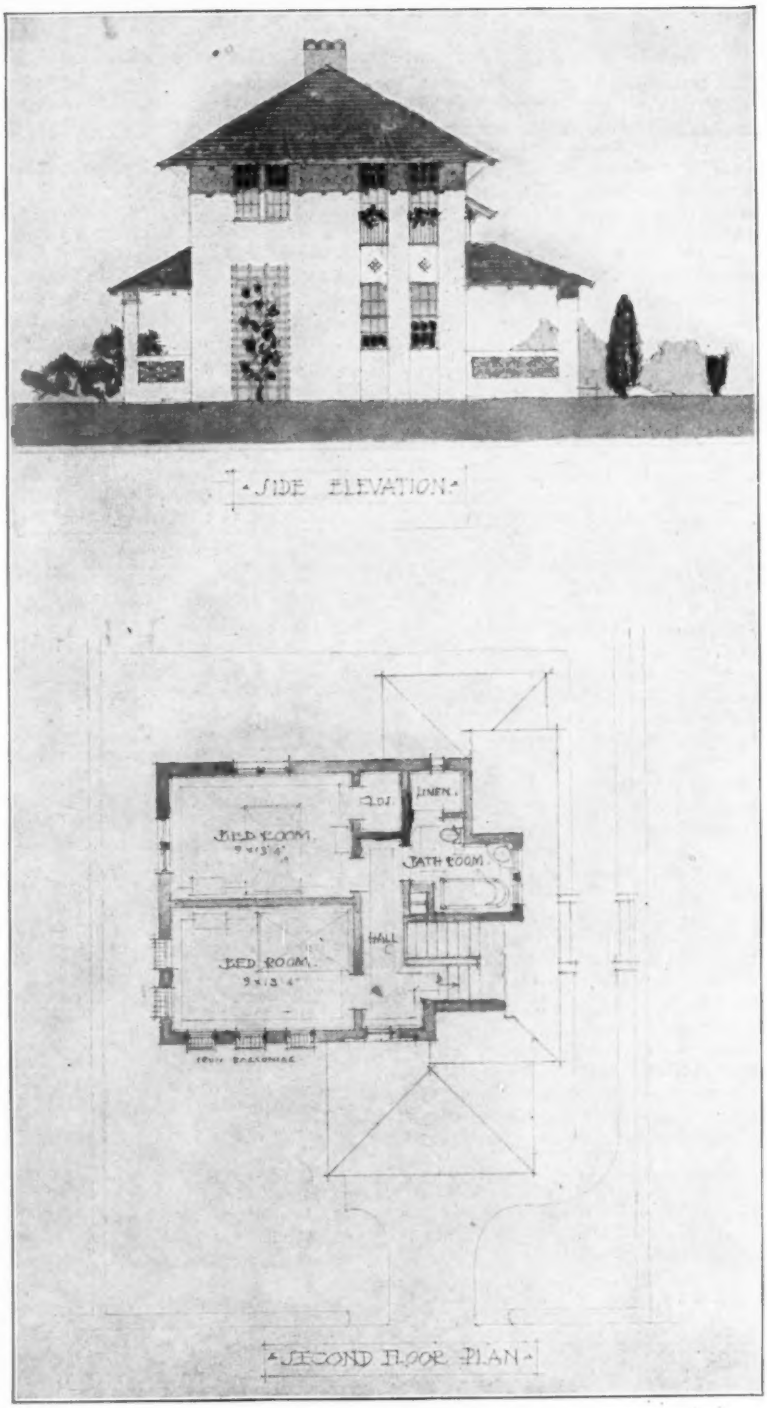
D. Kapp, G. Transformers for Single and Multiphase Currents. $1.75.

C. Paterson, G. W. The Manage- of Dynamos. $1.50.

A. Parkhurst, C. D. Electric Motor Construction for Amateurs. Illustrated. Net, $1.00.

C. Perry, N. W. Electric Railway Motors. $1.00.

C. D. Raymond, E. B. Alternating



CONCRETE DWELLINGS.

First Prize Class A1.

Current Engineering Practically Treated. 102 illustrations. Net, $2.50.

C. D. Sheldon, Samuel, and Mason, Hobart. Alternating Current Machines. Illustrated. Net, $2.50. Deals with the construction, design and operation.

C. D. Sheldon, Samuel, Dynamo Electric Machinery. Illustrated. Net, $2.00. Deals with the principals of design, construction and operation of direct currents machinery.

A. Frevert, Ed. Dynamos and Electric Motors. 50 cents.

D. McAllister, A. S. Alternating Current Motors. 278 pp., 122 illustrations. Net, 53.00.

C. D. Lamb, C. G. Alternating Currents, 325 pp., 251 illustrations. Net $3.00.

C. D. Crocker, Francis B., and Wheeler, S. S. The Management of Electric Machinery. 223 pp., 131 illustratons. Net, 51.00.

C. D. Smith, Charles F. The Practical Testing of Dynamos and Motors. 606 pp., 108 figures. $2.00.

Thomas, S. P. Dynamo Electric Machinery.

Hobart. Electric Motors.

Hobart & Turner. Insulation of Electric Machinery.

Parshall & Hobart. Electric Generators.

A. Cleveland Armature Works. Practical Electricity.

Williamson, Franklin. Alternating Currents.

Steinmetz, C. P. Elementary Electrical Engineering.

Steinmetz, C. P. Alternating Current Phenomena.

A. C. Salomon, Sir David. The Management of Accumulators. 174 pp., 38 illustrations. Net, $2.50.

C. D. Punga, Franklin. Single Phase Commutator Motors. Translated by R. F. Looser. 187 pp., 81 illustrations. $1.75.

C. D. Carter, E. Tremlett. Motive Power and Gearing for Electrical Machinery. 672 pp., 200 figures. Net, $5.00.

MISCELLANEOUS APPLICATIONS OF ELECTRICITY.

C. D. Dawson, Philip. The Engineering and Electric Traction Pocket Book. Illustrated. Flexible Leather. $5.00.

C. D. Foster, Horatio. Electrical Engineers' Pocket Book. Flexible morocco. $5.00. Tables, data and formulae relating to all branches of electrical application.

C. Meadowcroft, Wm. H. The A B C of the X-rays. Illustrated. 75 cents.

C. Norrie, H. S. Electric Gas Lighting. 50 cents. How to install electric gas lighting apparatus, including the jump spark and multiple system.

A. C. Norrie, H. S. Induction Coils. $1.00. Practical rather than theoretical.

D. Roentgen, Stoke and Thomson, J. J. Roentgen Rays. Net, 60 cents.

A. Travert, Edward. How to make and Use Induction Coils. Illustrated. 50 cents.

C. Yorke, J. Paley. Applied Electricity, a text book of electrical engineering for second year students. 420 pp., 153 illustrations. Net, $2.10.

C. Wittbecker, William A. Domestic Electrical Work. Illustrated with twenty-two diagrams. Net, 25 cents. Concise and practical explanations for plumbers, tinners and hardware dealers on how to wire buildings for bells, alarms, annunciators and for gas lighting from batteries.

ELECTRICITY AND ELECRICAL MEASUREMENTS.

C. Atkinson, Philip. Electricity for Everybody. Its nature and uses explained. $1.50.

B. Benjamin, Park. Age of Electricity. $2.00. Deals with various electrical developments in a popular manner.

A. Bonney, G. Electrical Experiments. 75 cents. A manual of instructive amusement.

B. Brackett, C. F., and others. Electricity in Daily Life. $3.00. A popular account of the application of electricity to everyday uses.

A. B. Child, Chas. T. The How and Why of Electricity. $1.00. A book of information for non-technical readers.

A. Clarke, W. J. A B C of Electrical Experiments. $1.00.

B. C. Fleming, J. A. Centenary of the Electric Current. 1799-1899. Paper cover. 50 cents.

A. C. Houston, E. J. Electricity and Magnetism. Net, $1.00.

A. C. Houston, E. J., and Kennelly, A. E. Electricity Made Easy. Net, $1.50.

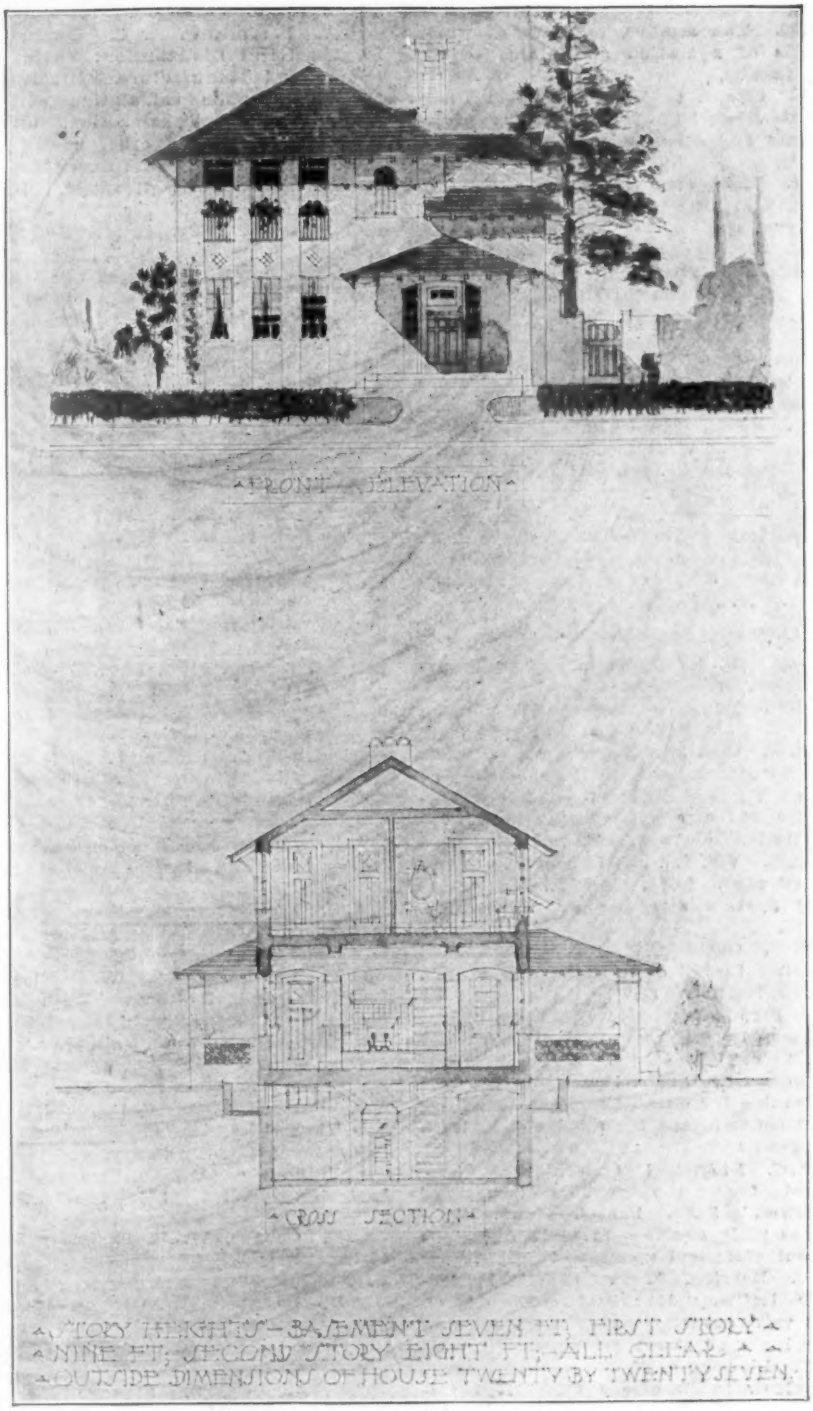
A. B. C. Jackson, D. C. and J. P. An Elementary Book on Electricity and Magnetism and Their Applications. Net, $1.40. One of the best books on elementary treatment of electricity that has appeared.

A. Meadowcroft, W. H. A B C of Electricity. Primary and non-technical. 50 cents.

C. Shepardson, George D. Electrical Catechism. Net, $2.00.

A. B. Sloane, T. O'C. Electricity Simplified. The theory and practice of electricity. Net, $1.00.

A. C. Sloane, T. O'C. How to Become a Successful Electrician. Net,


FRONT ELEVATION
CROSS SECTION
STORY HEIGHTS—BASEMENT SEVEN FT; FIRST STORY
NINE FT; SECOND STORY EIGHT FT; ALL CLEAR.
OUTSIDE DIMENSIONS OF HOUSE TWENTY BY TWENTY SEVEN.

CONCRETE DWELLINGS.

First Prize Class A1.

$1.00. The studies, methods of work, fields of operation and ethics of the profession.

C. Swope, C. W. Lessons in Practical Electricity. Principles, experiments and arithmetical problems. Net, $2.00.

V. Thompson, Sylvanus P. Elementary Lessons in Electricity and Magnetism. Illustrated. Net, $1.40.

C. Rosenberg, E. Electrical Engineering, Revised by E. B. Raymond. 347 pp., 333 illustrations. Net, $2.00.

C. James, W. H. N., and Sands, D. L. Elementary Electrical Calculations. 216 pp., 52 figures. $1.25.

Fleming, J. A. Electric Laboratory Measurements. $5.00.

A. Poole, Cecil P. The Wiring Handbook. With digest of underwriters' rules. 85 pp., 61 figures. Net, $1.00.

C. Alexander, J. H. Elementary Electrical Engineering. A class book for junior and senior students and working electricians. 208 pp., 180 figures. Net, $2.00.

ELECTRIC LIGHTING AND DISTRIBUTION.

D. Bell, L. Electric Power Transmission. Net, $4.00.

C. D. Bell, L. Power Distribution for Electric Railroads. Net, $2.50.

C. D. Crocker, Francis B. Electric Lighting. A practical exposition of the art for the use of engineers, students and others interested in the installation or operation of electrical plants. Vol. I. The Generating Plant. Illustrated. $3.00. Vol. II. Distributing System and Lamps. Illustrated. $3.00.

C. D. Cushing, H. C., Jr. Standard Wiring for Electric Light and Power. Limp leather. $1.00. As adopted by the Fire Underwriters of the United States, containing national electrical code, explained and illustrated, together with the necessary tables and formulae for outside and inside wiring and construction for all systems. With diagrams.

A. C. Electrical Catechism. Compiled from the regular issues of "Power." $2.00. Five hundred thirty-three plain answers to plain questions about electrical apparatus.

D. Herrick, A. B. Practical Electric Railway Handbook. Net, $3.00. Of value to engineers, operators and employes of street railways.

C. Livermore, V. B., and Williams, J. How to Become a Competent Motorman. $1.00. A book for the instruction of motormen in the safe and proper handling of various electrical equipments.

C. D. Perrine, F. A. C. Conductors for Electrical Distribution; Their Materials and Manufacture. Illustrated. Net, $3.50. The calculation of circuits, pole-line construction, underground working and other uses.

C. D. Pratt, Mason D., and Alden, C. A. Street Railway Roadbed. Illustrated. Net, $2.00.

C. Trevert, Edward. Electrical Railway Engineering. Illustrated. $2.00. Embracing practical hints upon power house, dynamo, motor and line construction for the use of students.

C. D. Still, Alfred. Polyphase Currents. 352 pp., 110 illustrations. $2.50.

C. Harrison, Newton. Practical Alternating Currents and Power Transmission. 375 pp., 172 illustrations. $2.50.

C. D. Hay, Alfred. Alternating Currents, Their Theory, Generation and Transformation. 291 pp., 178 figures. Net, $2.50.

C. D. Solomon, Henry G. Electricity Meters. 323 pp., 307 figures. Net, $5.00.

C. D. Adams, Alton D. Electric Transmission of Water Power. 335 pp., 105 figures. Net, $3.00.

C. Herrick, Albert B. Practical Electric Railway Handbook. 460 pp., 329 figures. Net, $3.00.

—Electro-Chemistry and Batteries.—

C. D. Blount, Bertram. Practical Electro-Chemistry. Net, $3.25. Not thorough, nor very accurate, but dealing in a general way with the industrial progress in electro-chemistry and electrometallurgy.

A. C. Bonney, G. E. Electroplaters' Handbook. $1.20. A manual for amateurs and young students.

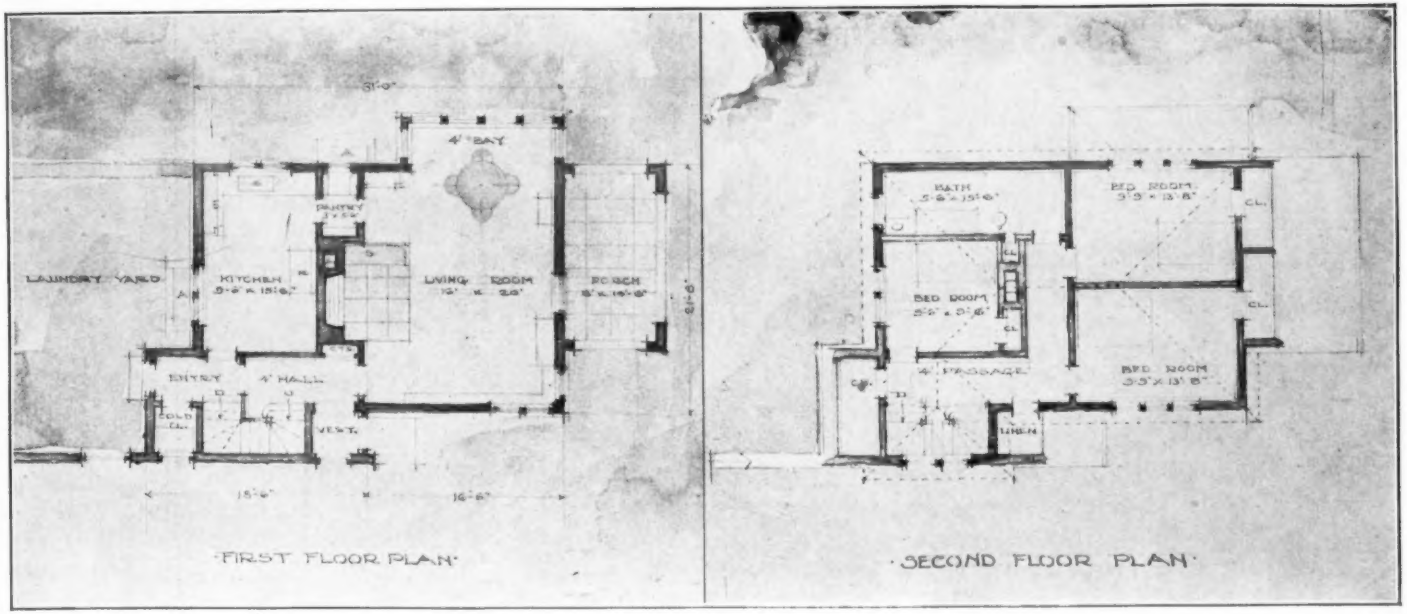
C. D. Borchers, Dr. W. Electric Smelting and Refining. With four plates and numerous illustrations in the text. Illustrated. Net, $7.00. The extraction and treatment of metals by means of the electric current.

C. Bottone, S. R. Galvanic Batteries, Their Theories, Construction and Use. Comprising primary, single and double fluid cells, secondary and gas batteries. With 144 illustrations. $1.50.

C. D. Cooper, W. R. Primary Batteries, Their Theory, Construction and Use. Illustrated. Net, $4.00.

C. D. Langbein, Dr. George. A Complete Treatise on the Electro-Deposition of Metals. Illustrated by 170 engravings. $4.00.

C. D. Lyndon, L. Storage Battery Engineering. Illustrated. Net, $3.00. A practical work devoted to designing, installing and maintaining battery equipments.



CONCRETE DWELLINGS.

No. 91. First Prize for house not exceeding $3,000. ALBERT G. HOPKINS, Boston, Mass., Architect.

EDITORIAL COMMENT

Forest Reserves.

Dustless Roads in England.

The Functions of Citizens' Organizations in Municipal Government.

FOREST RESERVES.

Next to irrigation, the preservation of forests is the most important subject pertaining to the material prosperity of this country, and the preservation of the forests is of great importance in its effect upon irrigation, so that the two have necessarily been considered together in our western country. As a consequence, all of the forest reservations made by the United States government have been made west of the Mississippi river. Another reason for this is, of course, the fact that in the far west the land so reserved was already public land and could be reserved practically without expense.

There are at least two other important reasons for making forest reserves, one of which has, thus far, received no official attention. Where rainfall is sufficient for all practical purposes, the forests would serve as reservoirs for the fallen water, and to some extent as distributers of the rainfall, and are beneficial in many ways. Thus, the reservoir action distributes the flow of water in the streams over longer periods of time, so that the floods are diminished in height and the period of average discharge is distributed over a larger part of the year. This reduces flood damage, increases the value of the water powers on the streams, and reduces the cost of storage of water for water power and water supply purposes. When the forests are removed the bare soil, formerly held by the tree roots, is washed away, this action being accentuated by the more sudden and violent fall of rain on a treeless region and the more rapid concentration of flow of water in the channels found and formed on the steep slopes of the mountains and hills. Erosion is greatly increased, obstruction of channels of streams is exaggerated, filling of ponds and reservoirs by debris is hastened, dredging of navigable channels and harbors is increased, all resulting in needless destruction and unnecessary expense.

These are some of the economic reasons for preserving and renewing forests in the mountainous regions of the east, which, while different, are no less important than those which have led to the forest reservations of the west.

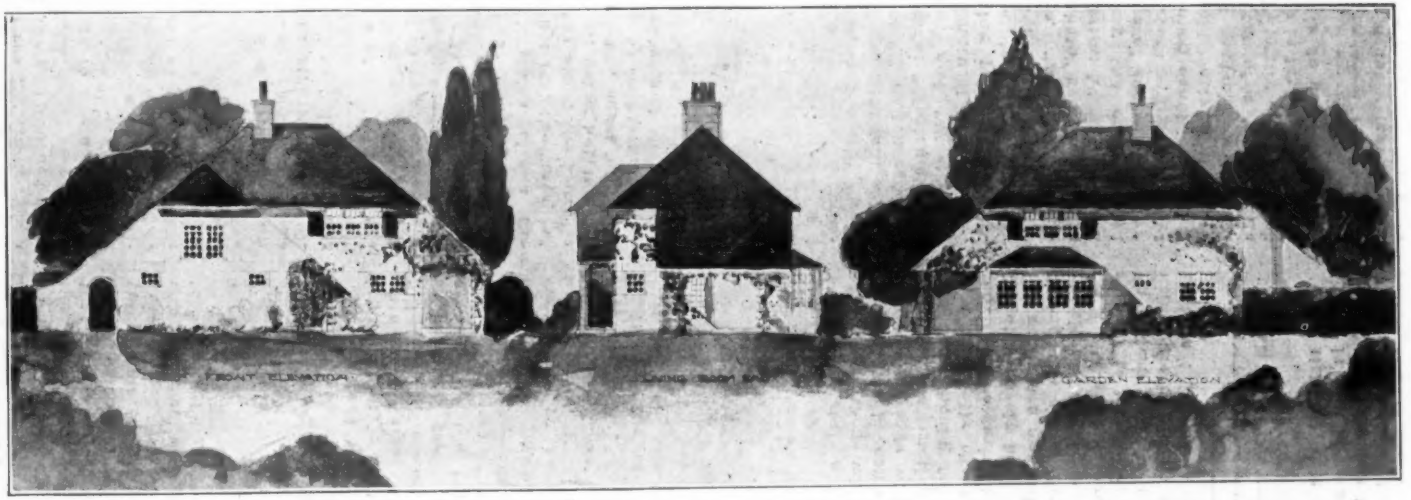
A serious difficulty is the expense of making the reservations, for, while much of the area which can properly be set apart for forest purposes is of little value at present, it must be purchased, and, what is a more serious expense, it must much of it be reforested.

There is a strong movement in favor of these eastern reservation, which resulted in the last congress in the Appalachian-White Mountains bill, which was urged by the president, passed by the senate, unanimously, and unanimously recommended by the house committee, but failed to reach a vote. This last failure makes it necessary to push the matter again in the next congress. Practically every expression of opinion is in favor of the reservation, and more expressions seem to be all that are necessary to bring success. The American Forestry Association, with headquarters in Washington, is a center of activity in this line, and is asking membership and assistance. The American Civic Association, with headquarters in Philadelphia, is also moving in the same direction, after a successful campaign in protection of Niagara Falls.

DUSTLESS ROADS IN ENGLAND.

The struggle for dustless roads is even more strenuous in England than it is in this country, on account of greater development of automobile travel, for passenger traffic and even more for freight traffic of various sorts, and of more dense population, thus accentuating the conditions of heavy wear of roads and the dust nuisance, which are becoming so serious in the vicinity of our own large cities and in the most thickly populated country districts.

The methods of construction, the materials used and the methods of application are numerous, and slight differences of composition and method of construction give rise to differences in trade names, with little or no difference in actual value, when equally good materials and workmanship are used.



CONCRETE DWELLINGS.

No. 91. First Prize Class A2.

One class mixes tar with stone and deposits it on the road. "Tarmac" is a mixture of coal tar and crushed blast furnace slag. Tytherington millstone grit gives its name to one firm's form of tar-macadam. "Tarlithic" is made with tar and granite of a certain quality. "Tarvia," the well-known American preparation, is also used both in making tar macadam roads and in treating the surface of roads. Some engineers make their own tar-macadam roads, according to their own judgment as to specifications for materials and methods of construction. "Quarrite" and the American "Bitulithic" are supplied by one company.

The applications of materials to the surface of roads are made by various methods. Some of these substances are bituminous and some are chemical in their nature. Tar is applied to roads by Aitkens pneumatic tar sprayer; the Lassailly machine for applying hot tar; the "tarmaciser," which cleans the road and applies hot tar; the "tarspra" machines of various sizes; the Thwaite anti-dust apparatus, using hot tar.

Preparations of tar, most of them treated chemically to enable the tar to be dissolved in water and then sprinkled on the road, are quite numerous. Among the trade names of such preparations are "Crempoid R," composed of tar, glue and bichromate of potash; Clares' tar compo; oil gas tar, with 5 per cent. water; "Hahnite," a compound of carbolic acid, oil, asphalt, tar, etc.; "Pulvicide," a compound of creosote, coal-tar pitch and resin; "Marbrit," tar and natural bitumen; solidified tar; "Ermenite," cottonseed oil, tar and caustic soda; "Westrumite 1," an emulsified tar, and "Westrumite 2," an emulsified natural bitumen.

Other dust-laying preparations, apparently not containing tar as the principal ingredient, are "Crempoid D," Calcium Chloride, "Akonia," "Dustroyd," the "Dustabato" system, "Riley's compound," "Newstrand."

As usual during the experimental stages, the reports of success are very conflicting, the success or failure apparently depending upon conditions which have not been sufficiently well determined or have escaped observation altogether. The cost of application is also very variable, partly on account of lack of expertness in laying and partly because the reports do not include the same items.

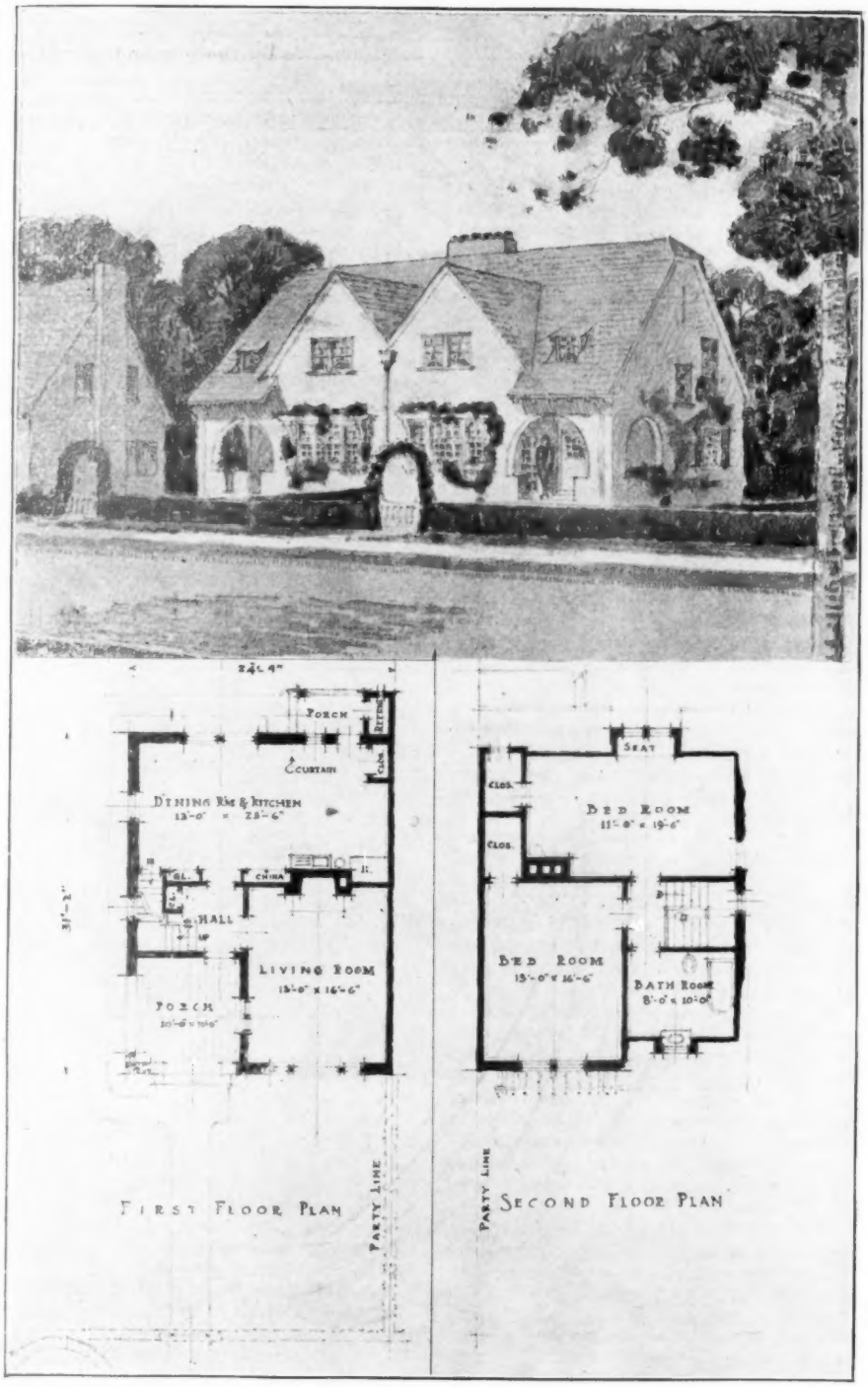
The English experience is an indication of what this country may expect. Thus far the new constructions have been more successful, mainly because the working out of the problem has been upon more strictly scientific lines, and the experimenters have not been so numerous nor the competition so fierce. Bitulithic pavement took the lead in the tar and stone pavements, and Tarvia and Asphaltoilene are equally successful in their field of dust prevention. The Wadsworth macadam, using Kentucky rock asphalt, is a paving material in the same class, the advantage of which England does not enjoy.

All this agitation for dust prevention, and for the improvement of country road surfaces, is the direct result of the development of the automobile. The bicycle brought about a material improvement in road surfaces, and the automobile is making a still greater improvement necessary. It is often said by the farmers and others who are directly taxed for road improvement that more of the cost of road improvement should be assessed directly upon automobilists through high license fees or some form of toll or mileage tax. From one point of view this claim is valid, and the farmer who sees his road promptly torn to pieces by the continuous line of automobiles past his farm has justification for his complaint that the road is good enough for his purposes and that if the automobilist is permitted to tear it up, he should pay for the repairs.

Good reasons for reasonably high license fees for automobiles are plenty, and they carry with them equally good reasons for state aid to the main traveled roads, those which connect prominent points in counties and in state. The better roads will cost the farmer more for construction and maintenance, and they should, for they will benefit him materially (he has his own automobile these days), but the entire cost is not properly his. The new uses for the roads are general, and the cost of fitting the roads for the new traffic should be paid by a general tax, I. e., from the state treasury. If the state sees fit to reimburse itself in part by an assessment upon the automobiles using the roads, no one can complain that an injustice is done.

THE FUNCTIONS OF CITIZENS' ORGANIZATIONS IN MUNICIPAL GOVERNMENT.

The title of this article indicates that it is devoted to a subject concerning which there has been considerable discussion in this department of Municipal Engineering for many years. The real attitude of such organizations is actually misunderstood or intention-



CONCRETE DWELLINGS.

No. 102. Second Prize for double house uot exceeding $2,000. Class B1.
GEORGE S. IDELL, Philadelphia, Pa., Architect.

ally misstated so often that a definite statement may serve a good purpose.

There is in Los Angeles a Municipal League which is doing good work. It claims credit for the city's civil service system, the permanent board of public works, the necessary petitions for ten miles of new pavements, non-partisan nominations for school board, defeat of unsatisfactory street superintendent, divorce of politics from the duties of city employes, passage of pole-removing ordinance, promptness in council meetings, defeat of river-bed franchise, and it is now working on as many equally excellent propositions. Not long ago one of the daily papers, intending to compliment the league, spoke of its value as being not so much in the matter of initiating new legislation as in detecting wrongs and in following up the evildoers. The League accepts the compliment, but objects to the theory that its chief function is that of a detective.

A study of the various items stated above, for which the League claims credit, will show that a considerable amount of what may very properly be classed as detective work must have been done before the ground could be cleared, or the reason for any desired change could be shown with sufficient emphasis to bring it about. The League's object, however, is the betterment of the city, and any revelation of objectionable conditions is only incidental, and its officers are therefore fully justified in their objections to the tendency to emphasize this side of the work.

A very common epithet applied to Commercial Clubs, Municipal Art Associations and others seeking the improvement of civic conditions is "meddlesome." Those interfered with by these efforts to improve conditions may honestly believe that they are doing all that should be required of them, or they may object because their maladministration is in danger of exposure, the result is the same, a request to the organization to mind its own business and leave others to mind theirs. In case the Improvement Association finds it necessary to oppose some project of the administration because it is believed to be objectionable, as a misapplication of money or an ill-advised expenditure, the Association may be termed an obstructionist, and be accused of delaying or preventing the proper development of the city.

There is, of course, room for difference of opinion regarding the propriety of a given mode of procedure, and it may sometimes happen that such an Association is on the wrong track and that the city administration is the nearer right, but this has happened very seldom, and the discussions which have been started have brought about a better result and have put the public into a better condition, even if progress has been delayed a little.

The municipality is really a business corporation, and should be operated on business principles. It is formed to do for its citizens what they cannot do for themselves so well. The citizens must have some way to make their wants known. In the ordinary campaign, certain lines are drawn and the election is supposed to be an expression of the desires of the people regarding certain policies in the city government, but usually only one or two such problems can be put up for discussion at one time, and the many details of city improvement, on which citizens have the right to express their opinions, must remain untouched.

The Municipal League, the Civic Art Association, the Merchants' Association, the Commercial Club take up various classes of civic problems, discuss them and express their opinions as to the proper methods of solution. These organizations are made up of the more intelligent, the more progressive, the more competent citizens, and their opinions are, on this account, worthy of careful attention. These organizations are likely to call to their aid more expert advisers than the city administration is able to afford. They are usually more permanent in their connection with these public questions than the city administrations themselves. In almost every case they have no such political difficulties to face as the city officers. They are thus well fitted to be the medium of expression by the citizens of their desires regarding municipal improvement. They are advisory committees of the taxpayers, to whom the municipal officials should listen and to whom appeals for advice and assistance can be made. Their tendencies toward extravagance or excess in expenditure must be curbed by the financial managers of the municipality, but their value as advisers cannot be too highly esteemed.

The detective work, to the emphasis of which the Los Angeles League objects, is largely necessary on account of the deleterious influence of political methods. As the work of these organizations educates the voters, as, consequently, municipal administrations become more anxious to work in harmony with these advisory committees

from among their creators, the necessity for detective work diminishes. In fact, there are now many cities in which but little of the kind of work outlined in the second paragraph of this article is necessary, and the efforts of the citizens' organizations can be largely expended upon direct additions to the advantages of municipal life, rather than upon the correction of defects in its operations.

THE QUESTION DEPARTMENT

HOW TO BUILD A CONCRETE GRAIN TANK.

Can you inform me where I can get any idea of the construction of a wheat tank or elevator? I am manufacturing concrete blocks, and a party wanted to know if I could build him an elevator of the blocks. The structure would be 12 feet in diameter and 40 feet high. Could this be built of blocks, or should it be built in a form? If built of blocks, what thickness should the wall be?

B. T. C.,
Higginsville, Mo.

Such a tank would probably be safest if made of reinforced concrete, built in a form. The wall should probably be seven inches thick at the bottom and five inches at the top. The reinforcement may consist of Clinton wire netting No. 9, with horizontal rings of rods alternately inside and outside of the netting, spaced four inches apart, and varying from one inch diameter at the bottom to 3-8 inch near the top. The rods should be wired to the netting. A five-inch Z-bar makes a good top ring, and the roof may be conical and say two inches thick. Full descriptions of several variations of this method of construction of grain and water tanks will be found in Buel & Hill's "Reinforced Concrete" ($5).

If any of our readers have built grain tanks of concrete blocks they are invited to contribute descriptions of their methods of construction and to make statements of their successes and failures.

WIDEST AND LONGEST BRIDGES OF CONCRETE.

How wide is the widest bridge in the world and how wide is the widest concrete bridge? Also, how long is the longest concrete bridge in the World?

S. O. B., Mishawaka, Ind.

The definition of the word bridge is necessary before an answer can be made to this question. If it is restricted to a bridge carrying a highway over a stream or watercourse the width might be the same as the width of the highway. Such bridges of 70 to 100 feet width are frequent and possibly there are some of 120 feet. There is no difficulty in making the bridge of any desired width. An arched culvert at the bottom of a deep fill on a railroad may be considered to be a bridge and such culverts occasionally are 200 to 300 or more feet long, i. e., in the direction that would be called width in a bridge. A covered stream may also be considered as spanned by a bridge and in that case the "width" is indefinite.

The same difficulty arises in defining the longest bridge. Probably the extension of the Florida East Coast Railway to Key West would be considered the longest concrete "bridge." It has several miles of concrete arches. The Big Four railroad has a bridge a quarter of a mile long or more in Southern Illinois. The longest span of concrete arch is about 165 feet, a new bridge in France. There is one in on Walnut Lane, Philadelphia, over Wissahickon Creek under contract which has one span of 233 feet, and there is one in contemplation in Los Angeles still longer.

Will our readers express their ideas on this subject and give some examples?

PLANS FOR CONCRETE HOUSES.

Can you give me the names of any books that treat on the subject of forming and making of various styles of cement concrete steps and stairs, also cottages and dwelling houses and estimates of cost, size of blocks, etc. I have seen advertisements of plans and of a book of plans, but think that it would be a waste of money to buy the same, as very few good men would sell even the outline of a hundred plans and estimates for a dollar or twenty-five cents.

C. F. R., Ware, Mass.

The "Handbook for Cement Users" ($3) gives instructions for making ce-

ment steps. Baker's "Cement Workers' Manual" (50 cents) gives some instruction in the same lines. Taylor & Thompson's "Concrete, Plain and Reinforced" ($5) and Buel & Hill's "Reinforced Concrete" ($5) give some instructions that may be applicable. The Association of American Portland Cement Manufacturers has just awarded a series of prizes for designs for concrete houses, and eight plates showing some of these designs are given in this number of MUNICIPAL ENGINEERING. All the prize designs will be published by the Association in book form. Of course, the best work will be secured from an architect. One who knows about concrete is essential. One of the results of the competition referred to is the knowledge that but few architects, even some of those competing, know the special peculiarities of concrete well enough to design buildings to make the best possible use of them.

NEW CEMENT COMPANIES.

Can you give me a list of new cement companies formed since the last edition of the "Directory American Cement Industries" was issued?

C. S. W., Calhoun, Ga.
S. P. G., Kansas City, Mo.

The good prices received for cement during the past year or two have resulted in the beginning of a number of projects for establishing cement plants. Many of these are of no particular value, and some of them do not even arrive at the dignity of a definite mailing address. The following list gives all those, reports of which have reached this office since the fourth edition of the "Directory of American Cement Industries" ($5) was issued. Some of these reports have not yet been verified, and many of them are of prospects which will probably not materialize. In the June number of MUNICIPAL ENGINEERING will be found a list of the new plants which have begun during the past 12 months, or are about to begin the manufacture of cement. The list does not include the extensions of and additions to existing plants, nor does it include the new plants constructed by companies already listed in the "Directory."

Arnold Cement Co., Arnold, Man. Natural hydraulic cement. Now closed.

Ash Grove Lime and Portland Cement Co., Kansas City, Mo. Works proposed at Chanute, Kan.

Ashland Iron and Mining Co., Ashland, Ky. Small slag-cement mill in operation.

Atlantic Portland Cement Co. is building works at Nazareth, Pa., change address in "Directory" to Nazareth, Pa., or Wm. J. Dingee, Pres., San Francisco, Cal.

Badger Portland Cement Co., Appleton, Wis., proposes a plant at Sturgeon Bay, Wis. Sec'y., C. C. Wayland, Portage, Wis.

Blue Seal Portland Cement Co., R. G. Weber, Pres., New York Life Bldg., Kansas City, Mo. Works proposed at Courtney, Mo.

Bonner Portland Cement Co., R. A. Long Bldg., Kansas City, Mo., proposes plant at Bonner Springs, Mo.

Butte Portland Cement Co., Butte, Mont. Works proposed near Logan, Mont. D. A. Morrison, Whitehall, Mont.

Calgary Portland Cement Co., Calgary, Alberta. Plant burned.

Cement and Iron Manufacturing Co., Los Angeles, Cal. Works proposed near Lindcove, Cal.

Central Portland Cement Co., Kansas City, Mo. Works proposed at Portland Center, near Elk City, and Independence, Kas.

Chuckanut Portland Cement Co., Waldron Bldg., Bellingham, Wash., incorporated by Theo Maynard and others.

Conestoga Cement Co., Lancaster, Pa., incorporated. Works proposed at Millway.

Commercial Cement Co., Winnipeg, Man. Works proposed at Leary's Siding in Roseisle tp. on the Carman branch of the Canadian Northern Ry. Natural hydraulic cement, CCC brand.

Continental Portland Cement Co., incorporated by Frank Brown, Independence, Kan., and N. D. McGinley, Guthrie, Kan.

Cowell Cement Co., San Francisco, Cal., organized to erect works at Concord, Cal.

Dewey Portland Cement Co., Dewey, Okla. Plant nearly completed.

Dirigo Portland Cement Co., Rockland, Me., incorporated. Reuben Leland, Pres.

Dixie Portland Cement Co., Iola, Kan. Works proposed near South Pittsburg, Tenn.

Dominion Portland Cement Co., Montreal, Que., incorporated by Henry Domville and others.

El Paso Portland Cement Co., El Paso, Tex., incorporated.

Great Lakes Portland Cement Co., Port Colborne, Ont., incorporated, with head offices at Toronto.

Greenbrier Portland Cement Co., McDonald, W. Va. Works proposed near Fort Spring.

Guthrie Mountain Coal and Cement Co., Kansas City, Kan. Works proposed at Mapleton, Kan.

Hawkeye Portland Cement Co., Des Moines and Harvey, Iowa, incorporated by A. G. Ripley and others.

Hidalgo Cement Co., Monterey, Mex., incorporated and increased capitalization, plant unfinished.

Hooker Cement Co., Hooker, Okla., reported incorporated by Jesse S. Moffit and others.

Humboldt Portland Cement Co., Topeka, Kan. Works proposed at Humboldt, Kan. C. H. Pattison, Pres., Kansas City, Mo.

Huron Cement Co., J. B. and E. L. Ford, Detroit, Mich. Works proposed at Alpena, Mich.

Independence Portland Cement Works, Independence, Kan., branch of Kansas Portland Cement Co., Iola, Kan., in operation.

Inland Portland Cement Co., organized by J. H. Spear, Spokane, Wash., to build plant at Colville, Wash., or Pend d'Oreille Lake, Idaho.

Inter-State Cement Co., organized at Wichita, Kan. Works proposed at Crane, Kan.

Inter-State Cement Co., incorporated at Colorado Springs, Col.

Iowa Portland Cement Co., Iola, Kan. Works proposed at Mason City, Iowa.

Fabrica de Cemento Italo Brazileira, Sao Paulo, Brazil. Works proposed in Rodovalho.

Kaw Portland Cement Co., Ft. Scott, Kan. Works proposed on Rock creek.

King's Rock Cement Co., Portland, Me., incorporated.
C. C. Nelson, Pres.

Lake Erie Portland Cement Co., New York, reported incorporated.

Lake Superior Cement Co., Duluth, Minn. Works for making cement from slag proposed.

Lawrence Cement Co., Sharon, Pa., reported organized by Edwin N. Nohl. Works proposed at New Castle.

Los Angeles Portland Cement Co., Los Angeles, Cal., incorporated.

Maryland Portland Cement Co., International Trust Co., 25 E. Baltimore st., Baltimore, Md. Works proposed near Hagerstown, Md.

Missouri Portland Cement Co., incorporated by S. T. Bisbee, Oklahoma City, Okla., and others.

Monarch Portland Cement Co., reported from Chanute, Kan., as incorporated.

Monroe Portland Cement Co., 419 Market st., Camden, N. J., incorporated.

Montana Portland Cement Co., reported incorporated by Fred T. Osborn and others to build a plant near Whitehall, Mont.

New Castle Cement Co., reported to propose plant in Muddy Creek township, near New Castle, Pa.

New York Portland Cement Co. See York P. C. Co.

New York-Wisconsin Cement Co., reported contemplating plant at Rush Lake, near Crivitz, Wis.

North American Portland Cement Co., Philadelphia, Pa., incorporated by the Alpha, American, Atlas, Lawrence, Lehigh and Vulcanite Cement Companies.

Northwestern Portland Cement Co., San Francisco, Cal. Works under construction at Kendall, Wash.

Oklahoma Oolitic Stone Co., 211 Security Bldg., Oklahoma City, Okla., is reported to contemplate building a cement plant.

Oklahoma Portland Cement Co., A. L. Beck, Pres., Mitchell, Ind. Works proposed at Ada, I. T.

Parsons Cement Co., reported to have purchased land for cement manufacturing of George Pace and others west of Chanute, Kan.

Patrick Cement Co., Mt. Sterling, Ky. Works proposed at Stanton, Ky., 50 miles from Lexington. J. C. Patrick, Pres.

Perkins Portland Cement Co., Salt Lake City, Utah, incorporated. Walter K. Perkins, Pres.

Portland Cement Co., Ltd., Winnipeg, Man. Works proposed at Gonor.

Pyramid Portland Cement Co., Seattle, Wash., reported incorporated by Jas. T. Lawler and others.

Riverside Portland Cement Co., works proposed near Riverside, Cal.

Rocky Mountain Cement Co. Works proposed at Frank, Alberta.

Rocky Mountain Portland Cement Co. Works proposed near Salt Lake City, Utah.

St. Mary's Portland Cement Co., Belleville, Ont.

Sndusky Portland Cement Co., J. W. Hawes, treas. and clerk, Kittery, Me., reported incorporated.

San Juan Portland Cement Co., reported as contemplating works in San Juan canyon, near San Juan, Cal.

Seaboard Portland Cement Co., reported contemplating a plant at Catskill, N. Y.

Shenango Cement Co., Allentown, Pa., reported incorporated.

Sierra Portland Cement Co., 832 Monadnock Bldg., San Francisco, Cal., reported incorporated.

Southern California Cement Co., reported incorporated by Wm. G. Henshaw, Oakland, Cal., and others. Works proposed at new town of Crestmore, near Riverside, Cal.

Southwestern Portland Cement Co., C. Leonardt, Pres., Los Angeles, Cal.,

has acquired cement properties at El Paso, Tex., and vicinity.

Southwestern States Portland Cement Co., W. F. Cowham, Pres., Jackson, Mich. Works proposed at Dallas, Tex.

Standard Cement Corporation, reported incorporated at San Francisco, Cal.

Superior Portland Cement Co., John C. Eden, Pres., proposes plant in Skagit Co., Wash.

Susquehanna Cement Co., George L. Sanderson, Pres., works proposed on Larry's Creek, near Williamsport, Pa.

Tehachapi Portland Cement Co., Portland, Me. Works proposed at Tehachapi, Cal.

Tennessee Portland Cement Co., W. J. Oliver, Knoxville, Tenn. Works proposed at Cumberland Gap, Tenn.

Three Forks Portland Cement Co., F. T. McBride, Butte, Mont. Works proposed near Logan, Mont.

Tulsa Portland Cement Co., Tulsa, I. T. Works proposed at West Tulsa.

Uncle Sam Portland Cement Co., Dwight Bldg., Kansas City, Mo., and Hays City, Kan. Works reported under construction at Yocemento, Ellis Co., Kan.

Union Portland Cement Co., reported organized at Iola, Kan., John A. Wakefield, Omaha, Neb., Sec'y. and Treas., to build works in Allen Co., Kan. Headquarters to be in Kansas City.

Union Sand and Material Co., St. Louis, Mo., has merged the Iola Portland Cement Co. and the St. Louis Portland Cement Co.

United States Portland Cement Co., reported incorporated at Denver, by Joseph D. Blunt and others, of Florence, Col.

Universal Portland Cement Co., has taken cement business of Illinois Steel Co. Works at North and South Chicago; works under construction at Buffington, Ind., and North Bessemer, Pa. Works proposed at Duluth, Minn.

Vancouver Portland Cement Co., incorporated at Ottawa, Ont. Headquarters at Toronto, Ont., office at Victoria, B. C., and works in operation at Keating or Tod Inlet, B. C.

Vindex Portland Cement Co., reported in formation to take up the Reading Cement Co., of Reading, Pa., with works at Molltown, Pa.

Vulcan Portland Cement Co., Montreal, Que., reported incorporated by G. W. Macdougall and others.

Wathena Portland Cement Co., Wathena, Kan. F. H. Drosselmeier, Pres.

West Coast Portland Cement Co., reported incorporated at Seattle, Wash., by J. M. Edwards and others.

Winona Portland Cement Co., Selma, Ala. Works proposed at Epes, Ala. Probably same as Minona Portland Cement Co. in "Directory of American Cement Industries."

Wolf Lake Portland Cement Co., Wolf Lake, Ind., reported incorporated by C. F. Knowlton and others.

York Portland Cement Co., 3001 Masonic Temple, Portsmouth, O., incorporated.

INFORMATION ABOUT CITY STREET PAVEMENTS.

Will you kindly advise me if there is a list published of all of the cities in the United States which tells the different kinds of pavements which they are using, and how much paving there is in each city? I should like to obtain such a list.

J. S. B.,
New York City.

The only complete list of cities having pavements is in Bulletin No. 20, issued by the United States Census Bureau, at Washington. It gives the data desired regarding pavements with reference to all the cities with more than 25,000 people. In MUNICIPAL ENGINEERING, vol. xxxi, page 103, vol. xxx, pages 202, 204, and vol. xxix, page 430, are similar lists. The one last mentioned is taken from the census bulletin referred to.

HAND POWER REVOLVING SAND SCREEN.

We noticed in your last issue inquiry of J. W. B., Hoopeston, Ill., relative to revolving screen worked by hand for separation of sand and gravel. We have in use in our yard screen of such description, which was built by our foreman, Carl Carlson, which we are using every day with good results. We are using pit sand, with a percentage of clay. The inner screen retains clay and delivers it in front of screen, while sand and cement fall under screen and with rapid revolutions are thoroughly mixed.

SMITH & MARSH,
Englewood, N. J.

TREATMENT OF CONCRETE SURFACES.

Kindly tell me how is the best way to get a smooth face on concrete wall and how long is best for forms to be left in place, and how long after foundation is put in before building should be commenced.

C. W. B.,
Catlettsburg, Ky.

Full instructions regarding several excellent methods of treating concrete surfaces will be found in three articles in MUNICIPAL ENGINEERING, vol. xxxii, pp. 177, 179 and 181, which is such

a recent number that it is probably not necessary to repeat the instructions here. The length of time to leave the forms in place before removal depends upon the kind of treatment to be given the face, as well as upon the kind of cement, condition of weather, amount of water used, etc., most of which points are mentioned in the articles referred to. The foundation should be about a week old, the rate of building making some difference in the age necessary, as slow progress is in effect equal to complete stoppage, followed by speedy work.

ROADS AND STREETS

Automobilists and Good Roads—New Jersey Roads—Oiled Roads—Thin Concrete Foundations—Prizes for Road Making Tools—Track Elevation in Indianapolis.

Work for Good Roads by Automobilists.

The work of sub-dividing the membership of the American Motor League into State divisions is now under way in thirty-four states. Each state has been divided into a convenient number of districts, and prominent automobilists are being selected to represent these districts on the several state boards and to serve on the state organization committees until the beginning of the next official year. The state boards will elect delegates to the national assembly, the first meeting of which will be held in October. The national assembly will elect officers for the ensuing year and will take up actively the work for improved roads, better road laws and the more equitable regulation of automobile travel on the streets and roads.

Several thousand copies of a little hand-book on roadmaking, entitled "Country Roads," are being distributed by the league. It is illustrated and includes separate chapters on "Road Philosophy," "Road Drainage," "Improving the Surface," "Cross Drains and Culverts" and "Bridges."

"Macadam Roads," a companion volume, has also been issued by the league, but the edition is now practically exhausted. Illustrations are now being prepaired for a revision of "Macadam Roads," and a large edition will be issued shortly. It will contain chapters on "History and Description of Macadam Roads," "Grades," "Drainage," "Making the Macadam Surface" and maintenance of Macadam Roads."

During April the league appointed sixty-one official stations and garages. The list now includes several hundred states. Each proprietor is under contract to allow a discount of 10 per cent. to all league members on all bills of repairs and supplies amounting to $1 and upward.

Governor Stokes on New Jersey Roads.

In disapproving that part of the supplemental appropriation bill which provides an additional appropriation of $80,000 for the building of permanent stone roads in the State of New Jersey, Governor Stokes says that the State has been most liberal in its appropriations for the development of highways. The regular appropriation last year was $270,000, to which $130,000 was added to meet the State's proportion of the expense of completing certain roads that had been authorized in excess of previous appropriations. This year, he thinks, the regular appropriation is sufficient for the building of new roads, more especially because the surplus has been reduced and the railroads are trying to deprive the State of $3,500,000 income. It is pointed out that the legislature has authorized an investigation into the exorbitant increase in the cost of stone roads, and it is not improbable that when this inquiry is made it will show where excessive prices have been charged and will lower the cost of road building and make the regular appropriation go far enough without the extra $80,000. The lack of care in the proper maintenance and repair of the roads already built is pointed out. Some of those for which the State helped to pay are going to ruin. Lack of repairs has caused many of them to deteriorate greatly. Ruts, hollows,

washouts and rough spots exist in many of the roads that were built at great cost, and they need repairing badly.

Automobiles on Oiled Roads.

The north shore towns, Glencoe, Evanston and Wilmette, Illinois, are trying to find a new kind of pavement which will stand the impact of motor car wheels driven by ninety-horse-power engines at a rate of thirty miles an hour. Oiling the roads has been found beneficial, as it gives the top dressing a close binding, but portions of Sheridan road and Ridge drive, which have been treated in this way for the last two seasons, show the effect of the auto tires.

Thin Concrete Foundations Enough for Bay City Streets.

In the construction of a brick pavement recently on Saginaw street, City Engineer Thompson, of Bay City, Michigan, laid five inches of concrete foundation instead of six inches, as has heretofore been the city's custom. Mr. Thompson believes that, as Portland cement only is used, there is no need for such thick foundations, and hereafter pavements on residence streets and streets not subject to the heaviest kind of travel will have but four inches of concrete base.

Prizes for Road Making Tools at California State Fair.

An exhibition of practical road-making will be conducted for the benefit of supervisors, roadmasters and others interested during the next state fair, at Sacramento, Cal., by State Engineer Nathaniel Ellery. The fair will begin September 2. Anticipating that manufacturers of the necessary implements will be glad to supply the same and help to operate them, the society offers special prizes for such implements in operations—a gold medal for first prize and a silver medal for second prize for each of the following implements:

Best road plow, best road grader, best oil distributer, best traction road roller, best road roller, other than traction.

Track Elevation in Indianapolis.

At the recent meeting of the Indiana Engineering Society the history of track elevation in Indianapolis was one of the prominent subjects for discussion. The leaders were three men who have together been connected with the idea from its inception until very recently. The beginning of the project by a committee of the Commercial Club of Indianapolis, under Mr. William Fortune's direction, was described by Mr. Charles Carroll Brown, who as city engineer and in co-operation with the committee, prepared the first general plan for track elevation. The essential features of this plan are now, after about fourteen years' agitation, being gradually adopted and worked out.

Mr. B. J. T. Jeup, who was Mr. Brown's successor in the office of city engineer, described the progress made under the city administration of which he formed a part, as follows:

After several conferences with railroad officials were held from time to time, progress being made toward securing the elevation of tracks, the writer was directed in 1898 to prepare plans to show that track elevation was feasible. Surveys were made of the railway systems of the city and profiles and plans were prepared showing the elevation and grades of tracks. With these plans as a basis, an ordinance was drawn and submitted to the Common Council to compel the railroad companies to elevate all of the tracks in the city. This ordinance passed August 23, 1899, and declared all steam railway tracks at grade nuisances.

The city was divided into districts and time set for the removal of tracks in each district. Consent and permission was given the railroad companies to abate the nuisances by elevating the tracks at street crossings in accordance with plans which were to meet the approval of the Board of Public Works. The time for removing tracks from District 1 or for the elevation of tracks in this district was made September 1, 1901. On April 1, 1900, a written demand was made upon the railroad companies directing them either to remove tracks or elevate them. Upon the failure of the companies to comply with this demand, mandamus proceedings were brought by the city to compel compliance with the ordinance.

The case was decided against the city in the Superior Court, and the decree of the lower court was sustained by the Supreme Court in a decision rendered February 4, 1903. The decision of the Supreme Court was to the effect that the city under its charter and police powers had not the authority to compel the railroad companies to construct and maintain a system of elevated tracks for all its various roads, but the city apparently had the right to compel the railroad companies to separate the grade at such crossings as were dangerous. Judge Jordan in his decision says:

The power of the relator may be conceded arguendo, either under its charter law or under Clause 5 of Sec. 5153 Burns Revised Statutes Supra, where any par-

ticular railroad crossing over its public streets by reason of the peculiar or particular circumstances or conditions thereof, can only be made safe for public travel thereover by elevating the tracks of the road to compel the railroad companies to discharge such duty or obligation.

The Supreme Court decision was rendered while the Legislature was in session. It was during Mr. Bookwalter's first administration. A bill was presented to the Legislature for track elevation but was defeated.

Previous to this time, in 1901, Mr. Kern, city attorney, drew up an amendment of the charter to give the city larger powers to compel track elevation, which amendment was also defeated. Mayor Bookwalter appointed a Railroad Commission to devise some plan to secure the elevation of the tracks or the separation of the grades. City Engineer J. B. Nelson prepared plans for the Union Railway tracks, which involved diverting Pogue's Run from its present course and converting it into a large storm sewer. The elevated track commission appointed by Mayor Bookwalter made no report.

As soon as Mr. Holtzman became mayor steps were at once taken to secure the separation of grades. The railway officials, at a meeting held February 14, 1904, agreed to submit plans for the elevation of tracks which would meet the approval of all of the railroad companies.

Plans, preliminary work for which had been done, were begun the year before by Thos. H. Jackson, railroad engineer. These plans, however, were not submitted to the city, but instead a plan was presented by the Big Four Railroad Company for the separation of grades at Massachusetts avenue and East Tenth street, based upon profiles previously prepared by the city.

There being more delay in reaching an agreement with the railroad companies as to the division of the cost of the work, an ordinance was presented to the Common Council for the separation of grades at this crossing. The city attorney was of the opinion that the city had the right to compel track elevation at crossings that were extremely dangerous. Before this ordinance was passed the city and the railroad companies reached an agreement, and a contract was entered into, the city agreeing to pay 25 per cent. of the total cost.

During Mr. Holtzman's term as mayor, the Legislature passed the track elevation law which is now in force. By its terms the railroad companies pay 75 per cent. of the costs of the separation, the city pays 17 per cent., and the county 8 per cent. where there are no street railway tracks at the crossing, and the city pays 14 per cent., the county 6 per cent., and the street railway company 5 per cent. at all crossings that are occupied by street railway tracks.

The aggregate expenditure for improvements can not exceed $400,000 in one year, but the Board of Public Works may enter into a contract with the railroad companies for a term of years for an improvement costing more than $400,000, but not more than $400,000 shall be expended in any one year. Under this track elevation law a resolution was adopted by the Board of Public Works for the separation of grades at West street, Kentucky avenue and the street west of White river. A contract was entered into with the railroad companies affected and work is now in progress.

Resolutions were also adopted for the separation of grades at Valley avenue and at Thirtieth street and the Big Four railroad tracks.

Following these sketches of the history of the matter, Mr. J. W. Stearns, who was for some years the assistant city engineer in charge of the track elevation work, gave the following more detailed description of the construction with which he was connected:

The two preceding papers have given the history of track elevation in Indianapolis to the beginning of construction, and the two years that have passed since the passage by the Legislature of the track elevation law has seen one crossing abolished and work under way on two others.

The completed work is the crossing of Massachusetts avenue and East Tenth street with the Indianapolis division of the C., C. C. & St. L., the C., I. & L., and L. E. & W. railroads. Work under way takes in the three important streets: West street, Kentucky avenue and Missouri street, at their crossings with the Vandalia, C., C., C. & St. L. (St. Louis & Peoria & Eastern division), and C. H. & D. railroads; at Valley avenue the crossing of the Indianapolis and Peoria & Eastern division of the C., C., C. & St. L. railroad.

The work at Massachusetts avenue and East Tenth street presented no difficult problems in engineering, either of design or construction; but the crossing was one of the most dangerous in the city, both from the nature of the crossing, an angling one, with two double-track main lines diverging, and from the limited vision of the tracks approaching the crossing, owing to the number of buildings and industrial sidings constantly occupied by cars awaiting loading or unloading. Massachusetts avenue, running in a northeasternly direction, is an improved street as far as Tenth street, and one of the most important thoroughfares of the city,

serving as it does as the most direct route to the center of the city for a large suburban territory. The terminal of the Indianapolis & New Castle electric line is to be built at the junction of Massachusetts avenue and Tenth street, and all traffic for the line will have to use this route. East Tenth street, an east-and-west street, intersects Massachusetts avenue at the crossing of the railroad tracks and serves as an outlet for a large residential district. A double-track city electric line runs out Massachusetts avenue, turning east into East Tenth street, and is used by two lines of cars, running on 10 and 15-minute schedules.

Roosevelt avenue, recently improved, and being rapidly built up in residences and industries, is another busy thoroughfare, and intersects Massachusetts avenue at the junction with East Tenth street. Here were three important streets intersecting at a railroad crossing used by four railroads, the Panhandle having trackage rights over the L. E. & W. for its Chicago trains, with forty-four regular passenger trains daily and almost constant switching and freight movement, seriously delaying the use of the streets by the public.

Plans were gotten up both by the city engineers and the engineers of the L. E. & W. The latter was authorized by the different roads interested to represent them. After several modifications, plans were submitted by the railroad which were acceptable to the city authorities. These called for the depression of Massachusetts avenue and East Tenth street at the crossings with the railroads of 3½ feet, using a 3 per cent. grade to reach the established grade each side of the depression. North of the crossing, Eleventh street, an unimportant street, was vacated where it crossed the right-of-way of the C., I. & L. and L. E. & W. railroads. South of the crossing, Pratt street was raised 5 feet, making it a grade crossing to be taken care of when the tracks were elevated toward the Union Station. The tracks at the crossing were elevated so that 14½ feet clear head room was provided. This raised the tracks about 13 feet, reached by a 1 per cent. grade in either direction. The tracks were raised on earth embankments with concrete retaining walls and waterproof floor bridges. Where it was necessary to raise the grade of Pratt street, concrete walls were built providing for a 24-foot roadway, leaving a 12-foot driveway on each side for the approach to the alleys parallel to the sidewalks, and the sidewalks at grade. Steps were provided where necessary for foot passengers to cross tracks.

The work was done under the direction of the chief engineer of the L. E. & W. railroad. Accounts were rendered monthly, each road paying its share and billing against the city for 25 per cent. The C., C., C. & St. L. paid three-fifths and the Monon and L. E. & W. one-fifth each.

In June, 1905, the contract for excavation, masonry and paving was awarded to the Marion County Construction Company, the lowest of eight bidders. Work was started promptly, and their part of the work was finished by January 1, 1906. During this time the streets were closed to the public, street-car passengers being transferred. The traffic on the railroads was diverted to a single track, that of the C., I. & L. and L. E. & W. being swung to the east side of the right-of-way and the C., C., C. & St. L. to the west and north. This enabled the building of the retaining walls and nearly all of the abutments without delaying trains. While this work was in progress the work of building embankments and temporary pile bridges was being pushed by the railroad company, so that by the time the walls were in trains could be shifted to the upper level and remainder of embankment and retaining walls built. The street was then excavated and paved, allowing the operation of a single track by the street cars, which was maintained until the permanent bridges were placed in position in May, 1906.

The concrete for walls and abutments is of White River gravel of a 1-2½-5 run, except for bridge and column seats, when a 1-2-4 mix was used. Cement was mostly of the Bedford brand. The concrete for walls was made in a Foote mixer run over the top of the forms. Expansion joints were formed at 60-foot intervals. The material for embankments was obtained at Noblesville on the line of the L. E. & W., loaded by steam shovel and hauled to Indianapolis in trains of 30 flats, each flat being equipped with aprons. At the embankment material was unloaded by a rapid unloader and center plow; the average load per flat was 9.04 yards. The material cost, unloaded at embankment, was 52 cents per yard. The cost of putting under and raising track was 28 cents per yard.

These figures were arrived at from the following data:

Labor as per distribution of pay-roll: Gravel in pit, 2 cents per yard; flats, each, 50 cents per day; caboose, each, $1 per day; steam shovel, $13 per day; rapid unloader, $8 per day; center plow, $3 per day; water, 25 cents per tank; trackage, 50 cents per mile; engine service, including pay of engineer and fireman, $2.75 per hour; train crew, 75 cents per hour.

The bridges are of two types, that of the C., I. & L. and L. E. & W. being of "I" beam construction supported at the curb lines and center of streets by columns with a floor of creosoted yellow pine

with joints caulked with oakum. The depth from base of rail to lowest point of bridge is 26 inches. It is a four-track structure, but used at present for but two tracks. The C., C., C. & St. L. bridge is a three-track structure of through girders with a through floor filled with concrete with felt cover and about 8 inches of gravel ballast. From base of rail to base of girder it is 36 inches. Both structures have developed some leakage. The total cost of the improvement was $134,000.

The work at West street, Kentucky avenue and Missouri street is of much greater proportion, the estimates being nearly three times the cost of the Massachusetts avenue work. It provides for a mile of new line for the Vandalia railroad from Kentucky avenue to a point 4,000 feet west of White River, where it joins the old line, all one embankment with a new 7-span bridge across White River and waterproof floor bridges at crossings of streets.

The trains of the Vincennes division of the Vandalia are to be diverted from Kentucky avenue, where they now occupy part of the street, the Belt railway at the crossing of the two lines, thence over the tracks of the latter road to its crossing with the main line of the Vandalia, and over these tracks to the Union Station. The present tracks on Kentucky avenue are to remain at grade, but to have no connection on the north with the elevated tracks, and will serve only for freight movements to the numerous industries along the line.

The tracks of the C., C., C. & St. L. railroad used by the St. Louis, Chicago and Peoria & Eastern division are to be raised, beginning at Capitol avenue and extending to the White River bridge, a distance of 5,900 feet. The old Chicago division track running north on Missouri street is to be raised at the crossing of Kentucky avenue, running the elevation out at Chesapeake street. The tracks of the C., H. & D. are to be elevated, as are those of the St. Louis division of the C., C., C. & St. L. The streets and avenues are to be depressed from 4 to 5 feet and tracks elevated, so that at Kentucky avenue and Missouri street a clearance of 14½ feet is maintained and at West street 12 feet. The greater clearance is necessary on account of the street-car lines using these streets. This work was started in October, 1905, but at present the Vandalia is the only line which has done any work.

The embankment has been made on this road from West street to the junction of the new and old line west of the river and the new bridges at White River and Parry avenue are in place. The foundations for piers and west abutment of this river bridge are on 20-foot piles cut off 20 feet below low water; the east abutment is on gravel foundations.

At the Valley avenue crossing of the C., C., C. & St. L. railroad, work is well under way. This improvement calls for a 40-foot waterproof bridge supported by concrete abutments with columns at curb lines; 440 feet of concrete retaining walls are provided to hold embankment where it was necessary to depress Massachusetts avenue to meet the grade of Valley avenue. Massachusetts avenue runs parallel to main tracks of the C., C., C. & St. L. railroad and about 15 feet south of the tracks. The cost of this work is estimated at $30,000, the city paying 17 per cent. and the county 8 per cent.

Uniform Compensation for Privileges in Chicago.

In an ordinance introduced by Alderman O'Connell, at Chicago, June 10, providing for fair and uniform rates of compensation for special privileges and franchises, he condemned what he called the present zigzag method of computing and deciding on returns for all franchises, including those for subsidewalk space, connecting bridges and bay-windows. His order directed the compensation committee to draft an ordinance making the rates fair, equitable and uniform. He said: "All taxation should be uniform. We now have an up-and-down system, which zigzags from 10 per cent. down, and then sometimes jumps to a lump sum for a certain number of years. This system, or lack of system, ought to be done away with and a uniform plan adopted."

Mayor Schmitz, of San Francisco, Deposed.

The formal removal of Mayor Schmitz from office, at San Francisco, was effected by the supervisors at a meeting held June 17, and Supervisor James Gallagher was named as acting mayor to fill his place. Mayor Schmitz was removed on the ground that, owing to his incarceration in the county jail, following his conviction on a felony charge, he is no longer able to perform his official duties.

AMERICAN WATERWORKS ASSOCIATION

Management of Small Works—Stripping Reservoir—Repairing Mains—Cleaning Mains—Accounts and Management.

The American Waterworks Association.

One of the features of the Toronto convention of the American Waterworks Association which adjourned on the 22d of June after a full week of papers and excursions according to the program printed in the June number of Municipal Engineering, was the large number of short papers on practical points of construction, maintenance, operation and management of water-works systems. A few of these papers are presented herewith and others will be given later. The large number of titles of papers on the program is evidence of the activity of the secretary and program committee and of the interest which the members of the Association are taking in proceedings. For a number of years the society conventions were rather perfunctory in the nature and the intereht in them was quite limited, but of late a new spirit has animated it and membership is now considered desirable.

The proceedings when printed require a book of several hundred pages, which, if published as a text book on water-works would command a price of $5. Membership in the Association, including the proceedings, is but $3 a year.

This portion of the magazine goes to press too early to contain a report of the discussions of papers and they will follow later.

Some Experiences in the Management of a Small Water Works.

By Howard Williams.

I believe that I represent one of the smallest water plants represented in this association.

Probably there are very few of the "big fellows," if you will allow the expression, who realize what is expected of the Superintendent of water works in a small city.

First he must be a man of tact. Whether the plant is owned by the city or a private corporation he is generally the only visible head. He is the man who must deal with the water takers, see that they pay their water rates promptly and that they are satisfied with the service. He must personally oversee the installing of new machinery, laying of water mains and repairs. He must be able and willing at a moments notice to jump in and fill any position from bookkeeper to shoveler. He must be ever on the alert to get better service from his plant.

If the plant which he represents is owned by the city his duties may be still more manifold. To illustrate, I will tell you of some of the things that I have done during the past year. To begin with I have sometimes been saddled with the title of Superintendent of Water Works and Sewers but I repudiate the last part of the title. I am afraid that if a new branch is added to my title for every new line of work that I am expected to take up, the burden would be greater than I could bear.

Early last spring a bridge over the river needed rebuilding and as this came under the supervision of the Board of Public Works, they thought that I should see that the work went forward. I did it, laying out the work and making a pattern for every angle that was needed. When this was completed a stone culvert under one of our principal streets collapsed and our Common Council ordered that it be immediately replaced with a solid cement arch and that the work be done under the supervision of the Superintendent of Water Works. Our Mayor, who by the way would make a rattling Sueprintendent of Water Works, asked if I would undertake it and because he used tact in the asking I agreed to do so.

During the same time I repaired a section of dock at the entrance to the harbor where a hand ferry is operated to carry teams over the river. When

this was completed there were some repairs needed on our intake pipes which extend into Lake Michigan. For this work we have a small steam scow that comes under U. S. Marine law and when the boat is in commission I act as pilot. While the work on the lake was in progress I was expected to put on a diving suit and go down to inspect the work.

This work lasted until well into August but in the meantime I had kept an eye on a contractor who was building a large cement building for the storage of coal at the pumping station, laid one half mile of six-inch water pipe and dug up and relaid 200 feet of sewer pipe besides attending to the usual odd jobs that turn up during the spring. At this time the young lady who had attended to the office work for several years saw fit to marry and I was obliged to look for a new bookkeeper. I am held personally responsible for the office and collections and for the next three months I was obliged to keep considerably more than one eye on this department.

When the work on the lake was completed I laid another half mile of water pipe, dug up and repaired 300 feet of sewer on a paved street, repaved the street and as it was getting late got things in shape for winter. We have about 200 meters in use. I read them myself and when repairs are necessary I do that also. To fill in idle moments I occasionally give the engineers a hand at the pumping station. I forgot to state that I am also a member of our fire department.

We have in our system 18 miles of mains, four miles of which are of wood that has seen twenty-five years service. Two Holly Pumps, 1,300 water takers.

I have had some experiences with meters during the past few years which, while they might have been easy for an older meter man than myself, were puzzlers for me some time. Several years ago I set a meter on one of the hotels at a resort about one and one half miles from the pumping station. A week after setting I stopped to see if it was working all right and found that it registered less than when it was set. As the meter was set right and there did not seem to be any indications that it had been tampered with I concluded that I had misread the meter in the first place and merely took the new reading as correct. The next week the readings was still less and things began to look serious. I took the meter out looked it over and finding it all right, replaced it, taking the precaution to cover it with a strong plank box secured with a padlock. Two days later the reading was still less. I took the meter out and replaced it with another and the day following the hotel had another bill against us. Although this was a conundrum the explanation was simple when once I found the key. The main was a new four-inch cast iron pipe nearly one mile long from where it connected to a larger pipe. In a hollow twenty feet or more below where the meter was set was a fire hydrant. As there was very little water being used on the line the coating on the pipe imparted a disagreeable taste to the water and I had flushed the hydrant every time I was in the vicinity, which was nearly every day. I found that the water coming into the pipe was not sufficient to supply the hydrant and also keep the pipes full where they went over the hills. Consequently whenever the hydrant was flushed every opening on the hills would suck in air causing the meter to run backward much faster than it would go forward with ordinary use. As the road to the hotel ran past the hydrant I had always flushed the hydrant first and read the meter afterward. A good check valve was placed in front of the meter and I had no further trouble.

We have had considerable trouble with sand in our mains which has made it difficult to get satisfactory results from meters in some sections of the city. However we have succeeded in shutting off the inflow of sand from the lake and expect to have less trouble from this cause in the future. I have had several cases where the meter would apparently take a jump either forward or backward and where the explanation was not easy to find. However I make it a practice to place a check valve either in front or behind a meter that is inclined to work for the other fellow and it generally corrects the trouble. I have had but one case where a meter has been tampered with, and in that case the party was trying to satisfy his curiosity as to how the thing worked. As he got the meter together wrong it shut off his supply of water and he was obliged to come to me for help and own up to what he had done.

Not long ago I had an experience in running a lead joint where the pipe was partly submerged. I do not claim that the idea was original with me,

and I do not know at this time where I heard of its being done in this way. However, as even a chestnut may be of interest to some one who has run up against such a proposition, I will tell you how I managed it. As I have said this pipe was partly submerged and as it came under one of the main timbers of a bridge it was impossible to raise it more than one-half of its diameter out of the water. After raising the pipe as far as possible the joint was yarned in the usual manner. As a clay roll would not stick in the water and I had no asbestos roll I used a piece of twisted hemp packing instead. The upper side above the water line was pieced out with clay with the usual pouring hole on top. On one side just above the water line I made an extra vent. Before pouring the lead I placed a small quantity of oil in the upper opening and the lead was then poured in the usual manner. The oil prevented the hot lead from coming in contact with the water and as the lead was poured it forced the oil down, which in turn forced the water out of the vent on the side of the pipe. The result was very satisfactory leaving the joint well filled and ready for calking.

Stripping Reservoir Land.

By T. W. Davey, Middletown, N. Y.

Large sums of money have been expended for stripping reservoir lands to prevent the growth of algae which are a source of great annoyance on account of the offensive odor and taste which they impart to the water; and also to the clogging of water mains by their adherence to the inside shell of the pipe.

Middletown, N. Y., has three reservoirs covering a combined area of 276 acres. They are impounding reservoirs and obtain their water from a few springs and the surrounding water shed. During the summer months large growths of algae make their appearance and, realizing the evil effects of impure and unpalatable water on the health of the community, and appreciating the fact that a city supplying an abundance of pure water attracts population and manufacturing enterprises, the Board of Water Commissioners in 1899 decided to install a filtration plant. After fully investigating the various methods of filtration the mechanical type of filters was decided upon, and subsequently a contract entered into with the Continental Filter Company of New York for a combined pressure and gravity system, which was completed in May, 1900.

As the summer months approached and the water attained its usual condition, due to the presence of algae, impediment to filtration became at once apparent by the clogging of the filters necessitating them to be washed more frequently than usual. An effort was then made to deepen the shores of Monhagen reservoir by excavating and forming an embankment wth slopes protected with riprap, thus stripping an area of several acres of land. For about two years the shore protected with riprap was apparently clear, but after that time became as bad as before—except in places where the water remained four or five feet deep.

During the latter part of July and the first part of August, 1904, there was a very disagreeable odor and taste in the water that even the filters failed to remove. Prof. James M. Caird, chemist, of Troy, N. Y., was called upon and after a thorough examination recommended the copper sulphate treatment, which was productive of good results in killing the algae, especially the smaller species. In Monhagen reservoir, the principal distributing reservoir and the one supplying the gravity filters, the amount of copper sulphate used was one part to 3,333,000 parts of water. Three days after treatment the algae known as potamogeton (pond weed) began to come to the surface and floated to the shores.

Each year since 1904 our reservoirs have been treated with copper sulphate by our local chemist, Mr. Irving C. Bull, with excellent results. Upon the recommendation of Mr. Bull, Highland reservoir was treated on June 1st, 1906, at the first appearance of the algae with the result that the water in that reservoir has been of excellent quality and remained so throughout the summer and up to the present time.

Monhagen reservoir was not treated until August 18th, 1906, some time after algae first began to appear, consequently did not respond to the treatment as rapidly as Highland, as will be seen by the following extract taken from the annual report of the Chemist for the year 1906:

"The growth of algae in Monhagen reservoir was so great that a strong treatment was made necessary, the copper sulphate being applied at the rate of one part to 1,848,000 parts of water. The progress of the treatment was not rapid, about ten days having

elapsed before any improvement was noticed. The water in this reservoir should have been treated fully seven weeks earlier. I believe this fact was made evident to all who viewed the conditions at the time of treatment.

"It is not economical to permit reservoirs to get in the condition as was Monhagen. The expense of treatment is greater and the best results cannot be obtained."

Repairing a Broken Force Main.

By. C. W. Wiles, Delaware, Ohio.

The sixteen-inch force main supplying the City of Delaware, Ohio, with water from the pumping station three miles north of the city, runs parallel with the highway.

About two and one-half miles north of the city it passes over an arched stone bridge which crosses a small stream, which, after heavy rains, often becomes a small torrent. The pipe line crosses the stream below the bridge and was not fully covered with earth, the top of the pipe could be seen through the water.

This stone culvert has heavy side walls covered with large slabs of cut stone. In March, 1898, occurred a very heavy rain fall, in fact a cloud burst, filling the valley above the bridge with a lake of water; the opening in the stone culvert was about eight feet high by nine wide, and was completely filled with water, the heavy rush of water undermined the foundations and the bridge fell.

It is supposed that one of the heavy cap stones of the bridge on the down stream side fell and squarely striking the water main, which at this time was under a pressure of about 50 lbs. broke out a piece about five feet long.

This occurred about eight o'clock in the evening and the supply to the city was at once cut off. It was some hours before the location of the break was learned, and on account of the high water nothing could be done that night.

The next morning it was found that about three feet of water was flowing over the broken main, and as it would take too much time to attempt to pump the water around the break, the writer at once set a gang of men at work uncovering the pipe for some forty feet each side of the break, with a view of raising the broken ends at the stream and putting in a temporary line.

A large derrick was brought and erected over the pipe on one side of the break; after three joints of pipe had been uncovered and the partially broken length in the water had been entirely cut by charges of dynamite, an attempt was made to raise the end of the broken main on the south side of the stream, but failed, then four iron jacks were placed by the side of the pipes, and with their assistance the broken end was raised in about thirty minutes, over three feet, clearing the stream of water.

By the same operation, the main on the north side of the stream was raised, the lead joints giving sufficient so than no damage was done to the main.

While the broken pipe was being taken from the joints a bridge was thrown across the stream.

We now had the two ends of the pipe above water, with one twelve-foot length broken entirely out.

The writer hoped to insert a twelve-foot length without cutting, and the use of a sleeve, as usual, and to connect up the line with a solid length of pipe.

We then jacked the north end of the broken line up several inches more and moved it to the east about a foot.

The south end was carried about a foot in the opposite direction, and an attempt made to roll in the twelve foot length. The bell end of the new pipe was carried over the spigot end of the old main, and the spigot end of the new pipe to the bell end of the old main, then the two ends of the old pipe were brought back into line again, and we had a solid twelve-foot length in place of the broken one.

Lead joints were run and calked and the pressure turned on, and with some slight calking of the other joints all were found as good as before the break.

This entire job including transportation of men and material two and one-half miles, was completed in less than twenty-four hours, with the use of one twelve-foot length of sixteen-inch pipe.

This repair left the pipe line some three feet higher than was desirable, so the trench was left open and after a few weeks, when the water in the stream was low, the entire line was let down to its bed, by undermining the pipe, and since that time there has been no trouble.

To have attempted to coffer dam the break and carry the water around, or pump it over the line, would have required several days' work, and the insertion of a solid twelve-foot length.

in place of two pieces and a sleeve, saved at least twelve hours' work.

The fact that the city was without water or fire protection made every hour saved of great importance.

Repairing Broken Submerged Pipe Line.

By Harry A. Lord, Superintendent of Water Works, Ogdensburg, N. Y.

The City of Ogdensburg, N. Y., is divided into two sections, known as the "East and West Sides," by the Oswegatchie River, which is the third largest river in the state.

The water works, which is owned by the municipality, is a system of direct pumpage into the mains. The pumping station is situated at the easterly end of a dam which crosses the river in the central part of the city, furnishing power for the pumping station and a large number of mills and manufactories.

The systems of distribution of the East and West Sides are connected by two submerged water mains.

One, which crosses the river above the dam is of eight-inch wrought iron, galvanized pipe, while the other crossing in the swift water below the dam, up stream from a heavy plate girder bridge is a twelve-inch cast iron main, 350 feet long, put together with Ward flexible joints. This pipe line, which was laid on the natural bed of the river without trenching, in an average depth of eight feet of water, was put down in August, 1898, and had therefore been in position nearly seven years without mishap, when, early in the morning of March 29th, 1905, it broke apart, at a time when the river was full of heavy running ice, and the water at extreme high water mark and rushing in a wild torrent.

A jam of ice piled up against the center pier of the bridge, causing the floating ice to crowd and sink to the bottom, almost completely damming the river. The ice crowded down onto and around the pipe line and when the pack started nothing could have withstood the strain so the pipe went with it.

Any water works man who has had experience with a direct pumpage system of water works, will appreciate the fact when I say that when this twelve-inch pipe opened at both ends, there were doings at the pump station, and to the men in charge it was evident that something had been opened and left open.

The pressure immediately dropped to but a few pounds, and the town was without water. It did not require much speculation to determine what had happened, so the gates at each end of the pipe were closed, and the normal pressure was quickly regained.

Examinations of the ruptured pipe line disclosed the fact that one of the lengths of pipe had broken in the joint, at a place where the current of the river had been strongest; and the broken pipe line had been carried down far out of its original position, and until the ruptured ends were about fifteen feet apart.

How to best make repairs was the question that was up to the superintendent.

At one time I was convinced that the best plan was to pick up the broken ends, raise the pipe over scows, and put in an additional length of pipe. At another time I was sure that the only right way was to procure divers and scows and work the pipe back to its original position, and then have a diver put on a special sleeve, and close the break, but I could not devise a way to hold the pipe from pulling out of the sleeve, if a heavy strain was put upon the line in the future, and again, bell divers are a necessity which ill befit the resources of a water works of moderate resources.

The scheme which was finally adopted, and which worked admirably, came not as an inspiration to the writer, but as a recollection of methods employed by Mr. Ward, patentee of the pipe, when laying the line originally.

The short ends of the pipe line were uncovered and made free as possible from gravel or other material which might obstruct or hinder it from being drawn shoreward. The pipe was disconnected at the westerly end, where the ground is low and flat, and a heavy capstan with horses for power was anchored, and made fast to it with block and cable tackle. After two or three slight mishaps to the tackle and failures to start the heavy load, the pipe line moved, and once started came quite freely, each length being melted free with kerosene heaters, and disconnected as it came ashore.

After the westerly portion of the pipe had been taken from the water, it was necessary to employ a diver to make fast to the broken end of the easterly portion with a heavy cable about an inch and a half in diameter. The power was applied, but the pipe would not move, the cable being parted several times in the effort.

It was found upon further examination, that the pipe had rolled over a

ledge of rock, and was jammed in such a manner that it was necessary to raise it out and on to the ledge, which was done by means of a scow and pipe derrick.

Once free, there was no further difficulty in hauling the easterly half of the pipe line across to the west side of the river and disconnecting it, as had been done with the first taken out.

The disconnected lengths were then carted to the high ground on the easterly side of the river, cleaned, coated with water proof metallic paint, and made ready to be put together again.

A tight wooden plug was fitted into the leading bell end to keep out gravel and other debris, a heavy wrought iron band was bolted back of the bell, and to this band were welded heavy iron draw bars, meeting in front of the center of the bell in a clevis to which was attached the cable reaching across to the capstan on the west shore. As soon as a joint was poured and caulked the pipe was hauled into the water by means of the cable, and in this manner the pipe was again made continuous, and upon testing found to be tight.

The cost of repairs was comparatively small, and while it is perhaps but a matter of time and of similar conditions obtaining before the pipe will be carried away again, it is believed to be good economy to pay for repairs rather than excavate a trench in the rock bottom of the river.

Cleaning Water Mains.

By Park Woodward, Atlanta, Ga.

The question of cleaning water mains is one that should interest water works management generally. When a water works system is first put in operation the piping system is too often put in to meet the contemplated consumption with little or no provision for the future growth of the town or city. This mistake is frequently made, especially when the system is owned and operated by a municipality, when first cost only is mainly considered. The consequences of this policy result very often in the system becoming inadequate in a few years for the demand upon it. If the rapid growth of the city brings about a greater demand upon the system than was contemplated, the only remedy is to take up the smaller mains and lay larger ones, but it more frequently occurs that the mains become clogged with mud or a tubercular formation, which reduces their carrying capacity materially, and results in loss of head by friction. In a system where the mains are of sufficient size to furnish the volume of water needed, it is much cheaper to have them cleaned out than to take them up and lay larger mains.

In Atlanta we have suffered for years with a tubercular growth in our pipe, which has resulted in reducing the carrying capacity of our system to such an extent that the pressure on our pumps had to be increased to enable us to overcome friction, and supply the system with sufficient water for domestic and fire service and give necessary pressure. To relieve the situation, the question of taking up all the small pipe in the congested and business parts of the city, and replacing them with larger pipe, has been under discussion for several years. Last year this question became so urgent that the water board called the attention of the city council to the matter, and put them on notice, that the thirty-inch main which delivers the water into the reservoir or settling basin was in such a condition that it could not deliver a sufficient amount of water to keep it supplied, the pumps at No. 2 station taking it out faster than it could be delivered and that an additional main had to be laid. This question was up before the city council when a proposition was made to clean out this main, restoring it to its original condition. The city council appointed a committee to investigate this matter, and on March 28th and 29th, two sections of 6-inch pipe were cleaned out to demonstrate what could be done. A cut was made on a 6-inch pipe connecting with a 20-inch main under 53 lbs. pressure, 220 feet from main. A 6-inch meter was put on this pipe and water turned on. The meter after running two minutes registered 270 cubic feet. After pipe was cleaned the meter was again put on and run two minutes, registering 400 cubic feet, showing in increase of 130 cubic feet or 978 gallons in two minutes, being an increase of 48.1 per cent. A second test was made with another 6-inch pipe, 250 feet in length, under similar conditions, and the meter registered 230 cubic feet in two minutes, and after cleaning registered 380 cubic feet showing an increase of 150 cubic feet in two minutes or 1125 gallons, being 65.2 per cent. The committee being satisfied, awarded contract to clean out the 30-inch main.

Before this main was cleaned, the 18,000,000 gallon pump which delivers the water into the reservoir was put under a pressure of 110 pounds, and made 11 revolutions per minute, delivering 11,880,000 gallons. After cleaning under the same pressure, it made sixteen and one-half revolutions per minute, delivering 17,820,000 gallons, showing an increase in delivering capacity of 5,400,000 gallons in 24 hours or 45.4 per cent. This enabled the department to fill the reservoir, and saved the expense of laying an additional 30-inch main (18,000 feet) at that time. The great success obtained here has resulted in the question being under discussion of having all of our mains cleaned out this summer. There is no question but what it will result in giving us a much better supply in many sections of the city where the pipes are reduced in size by reason of the tubercular growth in them.

A Few Experiences in the Examination of Water Works Accounts and Management.

By John F. J. Mulhall.

In the particular cases mentioned, both treasurers were exceptionally able men in other directions,—one being a bank president and the other town treasurer for several years.

The first case was that of a water company which had been running for about eight years, supplying a population of 20,000 with a capitalization of $150,000.

The treasurer's reports were submitted annually, each successive report showing a small profit, notwithstanding a large increase in the number of consumers, including a few very large consumers of water.

A practical water works man, both as to construction, management and operation was added to the board of directors, who was at a loss to understand why the profits were not materially greater; whereupon it was decided to have an examination made, which received the hearty concurrence of the treasurer.

On making a hasty examination, I found much to my surprise, that the accounts had been kept in a manner, practically showing the receipts on one side and the disbursements upon the other, without making any differentiation between cash received from the sale of water, supplies, notes issued, etc.; nor whether the payments were made for capital account, maturing notes, operation and maintenance, or fixed charges, etc.

It was absolutely necessary to rewrite the accounts from the beginning, the final result showing that after payment of all operation, maintenance and fixed charges, the plant was earning between three and four per cent. on the capital stock.

The other case where the town treasurer was also treasurer of the water works, was somewhat analagous to the foregoing, with the exception that he had merged the receipts and expenses of all the town departments together, including the water works.

The treasurer frankly stated that he could not tell from his accounts the amounts received from the sale of water; nor the payments made on account of the works.

The property owners had been assessed annually (included in the tax levy) to take care of the sinking fund requirements of the water works, amounting to from $2,000 to $3,000 annually.

In this case it was necessary to arrange a complete system of account books and forms, covering the financial and operating departments of the works.

After the books were written up, the net earnings of the works not only took care of its own sinking fund requirements, but also accummulated a surplus.

—General Errors in Accounting and Management.—

Repairs, renewals and depreciation.

A common error is to find items of repairs or renewals of original parts of a plant, especially when they amount to a considerable item, charged direct to a capital account,—construction. All such items are properly chargeable to "repairs" and finally charged out of profit and loss account.

For all items of renewals of a unit or units of a plant, such as the installation of a new boiler, pump, substitution of a new line of street piping, in lieu of an old boiler, pump or pipe line of same capacity, which have been discarded, such items should be charged direct to renewal account. If, however, the new installations are improvements and of greater capacities than the old one, it is fair to charge the excess costs less salvage, direct to capital account,—Construction.

If there has been a depreciation account opened of sufficient amount to cover all actual renewals and a fair allowance for the invisible depreciation which is always accruing in plants, then the item of renewals should be charged into depreciation ac-

count. If otherwise, it should be charged diirect to profit and loss account.

The subject of depreciation has so many ramifications, no two plants being exactly alike as to construction, location, source of supply, etc., etc., that I have referred briefly to the fundamentals.

Pump slippage, while more in the line of the management of a plant, nevertheless the results accruing therefrom are strictly financial,—the cost of the fuel, force, etc., necessary to operate same being one of the overlooked bung-holes in water works finance. Pumps should be keep in repair at all times so as to keep up as fas as possible their normal efficiency, —ocasional tests being made of same. Mr. Maury read a valuable paper on this subject wherein he stated he had found "pump slippage" ranging (as I now recall) from 12 to 85 per cent. on some tests which he had made.

—Records of the Physical Properties.—

A large number of water works fail to keep any complete record either by plan or books, of the kind, size, length, location, etc., of the pipes, valves and hydrants, which are buried in the ground; or of the dimensions, capacities, method of construction, etc., of the reservoirs, standpipes, boilers, pumps, filters, etc. In such cases, this information can be secured only from the "memory" of the superintendent or foreman; or from the original contracts for building some of the structures, if any. If the contracts are in existence, they are generally lost or misplaced in the office files.

The life of cast iron pipe under normal conditions not having yet been determined, it can readily be seen that a water works system will easily outlive two or three superintendents who were alone possessors of this information and in the great majority of cases by "memory or guess work" only. Furthermore, the necessity of having this information immediately available in case of breaks in the system, where damages resulting therefrom might amount to 100 times the cost (in case the superintendent was either absent or compelled to stay at home by reason of illness) of getting this data together, would appear to be sufficient reason for having both plan and book records covering same; or at least plans.

Classification of accounts is another subject which appears to have no consideration in a large number of water works. For all large systems the disbursements at least should be separated into units, such as: Pumping station, distribution, fixed charges, general expenses, construction, these headings being still further sub-divided, showing the details under each head.

The receipts, "water" should be subdivided into meters, fixtures, public hydrants, private hydrants, flushing sewers, etc.

A classification chart in the hands of the accountant or bookkeeper giving the details of the items chargeable to the ledger accounts and subdivisions thereof, would economize not only in time but materially assist in the accounting department.

For small works the accounting can be considerably condensed, if desired, by having ledger headings Water (Fixtures, Meters, Misc'l) Meter Rentals, if any; Expense, Repairs, Renewals, Fuel, Salaries and Wages, Taxes and Interest.

AFFAIRS OF MUNICIPALITIES

Changing Franchise Rates—Library Classification—Better Forms for Accounts—State Sewerage Board—Chicago Sewerage and Mississippi River—State Control of Water—Washington Filtration Plant.

Indiana Cities Cannot Change Existing Franchise Rates for Service.

Under a recent decision of the Indiana Supreme Court it is ruled that the Cities and Towns Act of 1905 does not give cities any power to regulate the price of gas sold by companies already operating under a franchise. The decision of the court was that in a case appealed from the Wayne Circuit Court, in which the city of Richmond sought an injunction against the Rich-

mond Natural Gas Company to prevent it from raising the price of its gas. In affirming the judgment in favor of the gas company, denying the injunction, Judge Montgomery held that the sufficiency of the complaint depends upon the validity of the ordinance under which the company operates.

For the purposes of this case, we need not determine whether or not the granting of permission and the construction of the plant in pursuance thereof created a contract, but content ourselves with a reference to the law holding that where a franchise to supply gas is granted without restriction as to prices, accepted and acted upon, cities incorporated under the general law of this State had no authority prior to 1905 by subsequent ordinance or action to impose additional regulations limiting the price to be charged for gas, charged under the original franchise.

After quoting Section 36 of the law of 1905, and further reviewing the case, Judge Montgomery says further:

It appears that the attempted regulation was not done by contract nor in connection with the granting or acceptance of a franchise, and the Legislature has not delegated the city any authority, whatever authority it may possess, to regulate prices of gas in any other manner. It follows that the ordinance relied on is invalid as against appellee, and that the demurrer was rightly sustained.

Library Classification of Engineering Industries.

The Engineering Experiment Station of the University of Illinois has recently issued Bulletin No. 9, "An Extension of the Dewey Decimal System of Classification applied to the Engineering Industries." This bulletin is in effect a fifth edition of the extension previously issued by the Mechanical Engineering department. It contains the extensions previously worked out for mechanical and railway engineering and in addition, a very complete extension for electrical engineering, and more or less complete extensions for bridge engineering, sanitary engineering, metallurgy and architecture. An alphabetical index of subjects adds to the usefulness of the classifications.

The decimal system of classifications devised by Mr. Melvil Dewey was intended primarily for the use of librarians in classifying and arranging books and pamphlets. It has, however, been used extensively by engineers, manufacturers and business concerns for indexing technical data of all kinds, catalogs, reports, drawings, etc. Bulletin No. 9 extends the work of Mr. Dewey to practically all fields of engineering industry, and presents a system of classification of great value to engineers and those engaged in engineering industries. Copies may be secured by application to the Director of the Engineering Experiment Station, Urbana, Illinois.

The Demand for Better Forms of Municipal Accounts and Reports.

Mr. L. E. Gosselin, auditor and deputy comptroller of Chicago, has put the present method of accounting and reporting common in American cities into a brief statement showing its defects and the methods of remedying them which is well worthy of study. He says that the method of accounting most generally in use in American cities is the Receipt and Disbursement System. The scope and purpose of administration officers seems to be comprehended in a cash account, showing the amount and source of receipts and the amount and source of disbursements with a little elucidation in departmental and other annual reports.

The system has the merit of brevity in so marked a degree, and has afforded so broad a field for explanation that the tax-paying public in some of our cities has frequently been provoked into pertinent as well as impertinent inquiry.

And the inquiries of the tax-paying citizen have of recent years become more persistent. He is not satisfied with a system of bookkeeping which virtually confines its showings to the columns of a cash book and an annual report. Now comes the statistician to collect and relate the facts bearing upon the cost of fire protection, of police protection, of pumping water, of street cleaning, of street paving, of sewer building, etc., down through the whole list of services essentially necessary to the public safety, comfort and welfare.

His purpose is a good one, he desires to present in concise yet comprehensive form, information that will be helpful to the honest official, striving to give the people both efficient and economical service. He desires to be instructional to the tax-payer, who is always interested in knowing how much more, or less, his dollar is buying than is the dollar of the tax-payer in other cities. He knows that "comparisons are odious," but the statistician in his efforts to render a worthy and needed service, has bravely brooked the odium involved in making comparisons of the cost of Public

Service and administration in various American cities. He has ever been so courageous as to compare the cost of such public services in foreign cities with that of the cash book showing made by some of our own. He has tried hard to get at the facts, but the results of his industrious efforts have been most unsatisfactory and to no one more so than himself.

They are unsatisfactory because they are misleading for purposes of comparison. The results and conclusions are confusing because the accounts of some or of all the cities subjected to comparison were so meager in point of information given and so lacking in uniformity of classification that the statistician, skilled both in comparison and deductions as he is, could not accurately ascertain the cost of the services about which he sought information.

To the municipal official desiring to give efficient, economical service and administration, and to the statistician desiring to present comparisons that are not "odious" but helpful and instructive, a comprehensive comparative accounting in detail of expenses and revenue is essentially necessary and I am of the opinion that the demand for such accounting is yearly growing more insistent and imperative.

Dr. L. G. Powers, the chief statistician of the U. S. Census Bureau, learns from his experience in collecting and comparing municipal data that it is only by the employment of a considerable number of experts in the field that any reasonably accurate data can be dug out of the mass of unrelated statements made in the average city report, and that the aid of all the office records is required to put these data in shape for use. He finds but little actual dishonesty in city departments, so far as the expenditure of city funds is concerned, but he finds much ignorance and incompetence. He is strongly of the opinion, he says, that the losses and wastes in certain branches of municipal work are vastly greater than all those accompanying graft and peculation to which the yellow journals call our attention. These losses and wastes are strictly comparable to those overcome in railroading and manufacturing by changes of methods based upon cost accounting. Do any of you ask where are these wastes in city government? I can only answer by repeating a statement made to me by a gentleman actively connected with the Merchants' Association of New York City and giving much labor and study to the subject of the civic conduct of that great city. We were talking about the waterworks of New York, and he said that with the accounts of the water department of that city placed on a thoroughgoing business basis so that the water passing through the pipes in one block could be checked with that for all other blocks, and all details looked after as in private administration, the result would be surprising. It would disclose wastes, abuses, and losses representing an aggregate equal to one-half the present water consumption of the city. A similar remark has been made by a gentleman in the city of Washington. These gentlemen have pointed out that this condition of affairs was not exceptional in the cities of which they spoke; it affects all cities in almost equal degree. What is true of the water department is doubtless true of all municipal activities concerning which—as compared with successful railroad management—our accounting is primitive and inefficient.

The cities of Great Britain are claiming great advantages from municipal trading. Their conclusions are challenged largely on the ground that their accounting methods are faulty and they show an apparent gain in the face of an actual loss. The same situation confronts us in this country. The thoughtful men can be sure of but one thing—our city accounts are defective. They do not furnish for our public utilities the information needed for their most successful administration. Their administration must be somewhat inferior to the best directed private industries, in the same manner as the administration of one private industry with poor accounts is as a rule inferior to the one with good accounts. The cities can only hope to excel in this field by borrowing the accounting instruments of private business. If they fail to do this there can be but one outcome of any further extension of municipal ownership and operation of public utilities. With the revolution in our accounting which will make our cities' administration in this respect as good as is the honesty of their management, there may be a success.

I refer especially to this subject of municipal operation of public utilities, not because it is more important than the management of our streets, our sewers, and all kindred city activities and functions, but because it is even more in the public mind at the present time. The demands of city life in-

crease so fast that our city expenditures upon the present basis have outrun our public revenue. Our cities are running into debt with a wonderful rapidity. Our per capita municipal debt is twice what it was thirty years ago, and has increased in the last ten years more than in the preceding twenty. This increase of debt can not go on indefinitely. It is already raising the rate of interest on city loans. We must find means of intelligently reducing expenditures by methods analogous to those by which railroads and manufacturers have reduced their operating expenses in the last generation. It can be done; it must be done, or our city civilization will lag. It can be done only as we have the whole field of municipal activities under wise and intelligent administrative control, such as can be secured only by the best accounting. Such accounting has its beginning in the uniformity which you have asked me to discuss, and for whose introduction so many of you are working. It is here then that we find the most vital relation of such accounts to municipal government, and to the people who support them.

State Sewerage Board Advocated for Ohio.

The appointment of a state commission to have charge of sewerage is advocated by City Engineer Dannenhower, of Cincinnati, Ohio, and an effort will be made to commit the Hamilton county delegation to such a bill in the legislature. He says:

We are hearing much of extensive park schemes and there is a great amount of talk about annexation, but the greatest problem before the people is the question of the disposal of sewage. We all admire what is beautiful and we are proud of bigness, but health is an absolute necessity, and health in a city is largely dependent on a sewerage system. We are far behind other cities in disposal of refuse. We have no system to speak of. For instance, we are building a big sewer known as the Bloody Run, that will collect the sewage of Walnut Hills and Norwood and then what do we do? Dump it into Millcreek. In other words, we simply shift a nuisance.

There was some discussion following the finding of the body of a woman in one of our reservoirs, but one small sewer above the intake of the waterworks sends more contamination into our drinking water than would a dozen bodies. Cincinnati might have a perfect system and yet a nearby city or village an imperfect one, and a contagious disease could start that would reach this city. We need a state sewer board, such as Massachusetts and other eastern states have.

Mr. Danenhower's purposes would be attained by increasing to some extent the powers which the State Board of Health of Ohio now possesses.

Effect of Chicago Sewage on Mississippi River.

The discharge of the sewage of the city of Chicago, by way of the Chicago drainage canal and the Illinois River into the Mississippi River, raised a question as to the possibility of the pollution of the Mississippi from such source, of great importance in connection with problems of municipal water. To decide this question, a proceeding in equity was instituted by the state of Missouri on January 17, 1900, against the state of Illinois and the sanitary district of Chicago, and the testimony taken in this suit comprises the best symposium on river pollution, its biological and chemical aspects, and its general and special sanitary significance, that has ever been assembled. The contentions of both parties to the suit were supported by the most eminently qualified men in the United States, and the evidence presented and the discussion recorded are therefore of unique importance.

A digest of this evidence, prepared by Mr. Marshall O. Leighton, of the United States Geological Survey, has just been published by the Survey as Water Supply Paper No. 174.

From a mass of testimony so voluminous that the average mind shrinks in dismay from the mere thought of traversing it, Mr. Leighton has produced an abstract whose fairness must be generally conceded. Skillfully avoiding the irrelevant and purely incidental features of the discussion, he has selected the salient points presented by both sides, and put them in such form as to render them readily intelligible even to the layman. As a result, the substance of eight bulky volumes—over 8,000 pages—has been condensed into one volume of 350 pages, and the object stated in the introduction—the presentation of a faithful statement of the scientific phases of the testimony, to the exclusion, if need be, of the legal aspect of the case—seems to have been attained.

The report closes fitly with the full text of the opinion of the court, as rendered by Mr. Justice Holmes, February 19, 1906.

Opinions For and Against State Control of Water in Streams in New Jersey.

An opinion was given by Attorney-General McCarter, May 31, at the request of Governor Stokes, of New Jersey, construing the effect of two of the

questions contained in Senator Hillery's potable water bill, which is now in the hands of Governor Stokes, awaiting his approval or veto. In the opinion of the attorney-general, the bill, if it becomes a law, will not affect injuriously the rights enjoyed by any municipality to take potable waters for drinking purposes, nor will it legalize any privileges now exercised by a corporation or water company without legal right.

Attorney-General McCarter's opinion is as follows:

Does Senate bill 116 injuriously affect the rights now enjoyed by any municipality to take potable waters for drinking purposes and municipal uses, or injuriously affect any municipality by diminishing the flow of the stream upon whose banks it may lie?

"Does Senate bill 116 in any way confirm or legalize any privileges which any corporation or water company engaged in the business of appropriating and selling water now exercises without legal right?

I have carefully examined Senate bill 116, being "An act to establish a state water supply commission, and to define its powers and duties, and the conditions under which the waters in this state may be diverted," with particular reference to the two questions above enumerated, and, in my opinion, both questions should be answered in the negative.

Referring specifically to the first question, it must not be overlooked that the juxtaposition of a municipality upon the banks of a stream of water gives to such municipality no inherent right in such water for water supply purposes, and this is true even if such municipality be a riprarian owner. By a long line of decisions, too well settled to be now even questioned, each riprarian owner has the right to have the waters of a stream flow by his land undiminished in quantity and uncontaminated as to quality; and no municipality has the right as against a lower proprietor to abstract from such a stream any substantial amount of water as a water supply.

This principle has been heretofore largely ignored by municipalities in this state, whether riparian proprietors or not, and without regard to their adjacency to the streams from which they have taken a water supply and one of the principal, and to me, most praiseworthy objects of the bill under consideration is the fact that a commission is there provided for, which, on behalf of the state, will put a stop to this selfish policy, and endeavor to regulate the abstraction of water from its great natural sources in accordance with some principle, and with due regard to the rights of all.

The commission will undoubtedly have the right to permit a municipality or water company, under proper conditions and limitations, to take from our streams for potable purposes a given amount of water, and this will undoubtedly have the effect, if availed of, of minimizing the quantity of water that will thereafter flow by a municipality situated lower down the stream. As a physical fact, therefore, your first question should be answered in the affirmative, but as a legal question it should obviously be answered in the negative, because under the practise heretofore prevailing it has been the custom of municipalities and water companies to help themselves to running waters, in many cases in total disregard of the rights of lower riparian owners or municipalities. Hereafter that will be impossible, and when such a right is granted by the proposed commission it would only be after due regard to the lower municipality to be affected, and upon terms that will not, at least, ignore such lower municipality. Many laws are now in effect which authorize municipalities to help themselves to the waters of the streams in total disregard of the rights of lower municipalities, and this unfortunate condition will also be obviated if Senate bill 116 becomes a law.

Turning now to your second question, I have also concluded that this proposed law does not in any way confirm or legalize any privileges which any corporation or water company engaged in the business of appropriating and selling water now exercises without lawful right. The eighth section of the proposed law, among other things, provides:

Every municipality, corporation or private person now diverting the waters of streams or lakes with outlets for the purpose of a public water supply, shall make annual payments on the first day of May to the state treasurer for all such water hereafter diverted in excess of the amount now being legally diverted, provided, however, no payment shall be required until such legal diversion shall exceed a total amount equal to 100 gallons daily per capita for each inhabitant of the municipality or municipalities supplied, as shown by the census of 1905. * * * Nothing in this act shall be construed to confer upon any municipality, corporation or person any franchise not already possessed by said municipality, corporation or person, but the approval of the said commission contained in its decision as above provided shall constitute the assent of the state to the

diversion of water as against the state in accordance with the terms of said decision.

It seems to me difficult to imagine phraseology more carefully selected to preserve the property rights which have not heretofore been legally acquired by any water company, person or municipality than the foregoing. After the proposed commission shall have assented to the proposed diversion on behalf of the state, and the latter shall have received the compensation required by the commission, it is obviously fair that the state, as such, should no longer be justified in objecting to the diversion. Of course, the commission cannot affect or in any way infringe upon the private interests or individuals, and this bill in no way purports to so legislate. So, too, if by reason of anything that has transpired before, a municipality, water company or individual is today legally diverting water as against the state, then the state should not undertake to collect a stipend for a right which it has heretofore surrendered; hence the provision in the introduction of the eighth section excepting from the provision for future payments any quantity of water that is already legally diverted. If, on the other hand, it be not legally diverted, then the quantity so illegally diverted is to be included in ascertaining whether or not the amount abstracted equals 100 gallons per capita of each inhabitant in the municipality supplied.

In the opinion of former Judge Francis Child the bill, if it should become a law, would mean a more startling abrogation of the right of municipal self-government than any such attempt made in this state up to and including the so-called "Bunsted charter" for Jersey City. That measure became so unpopular that no direct effort has been made since to control all the affairs of a municipality by a state-appointed commissioner. Mr. Child argues that the proposed law would abrogate a portion of the rights of Newark, and brings forth some facts that are not generally known as to the absolute ownership, by Newark, of the water it draws from the Pequannock watershed. Not only did the city buy the reservoirs, pipe lines, rights of way and lands, but it also bought the water, he avers. To do this, it was necessary to quiet the title of riparian owners below the point of diversion, and that was done. By means of perpetual leases and deeds, it was made possible for the city to keep perpetually closed a number of gates in the raceways of the Society for Useful Manufactures at Paterson, thus retarding a flow of water equal to the entire flow of the Pequannock. As the assent of the state to this diversion had also been secured through general statutes, Mr. Child holds that the ownership of the water is vested in Newark absolutely, and it is for this reason that the state has no right to interfere and declare that the municipality can make use of only such a proportion of her own property as the state may prescribe.

Success of Washington Filtration Plant.

A report regarding the recent operations for the preliminary treatment of the water before its admission to the general filtration system near the Soldiers' Home, Washington, D. C., was made to General Mackenzie, chief of engineers, June 17, by Major Cosby, engineer in charge of the water supply of the District of Columbia. He says:

The experimental filtration plant was operated continuously during the month of May, except that the slow sand filter, which is supplied from the coagulating basin, was shut down and cleaned, and for that reason was out of service for three days.

The water applied to this plant was uniformly of such good quality that the effluent from each group of experimental filters was entirely satisfactory. The character of the applied water, however, brought out some of the characteristic points of each system. It showed that an ordinary sand filter operated at fifty million gallons per acre day will do nearly all the work of purification and clarification when the applied water is of reasonably good quality, and that a second filtration amounts to nothing. When the water is more turbid, however, some work is done by the second filtration. The small amount of clay removed by the second filter is shown by the fact that it has not been sufficient to cause any loss of head in a period of about four months of continuous operation at a rate of 4,000,000 gallons per acre day.

The characteristics brought out in the Maignen group were similar to the foregoing, but not so marked. Less work was done by the preliminary filter and more by the second filter. No coagulant was used in the coagulating basin during the month, and, in fact, none has been used since April 16. The turbidity results from this system were excellent, the clarification having been more complete than by either of the other systems.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal Reports.

Thirty-Second Annual Report of the Water Board, Bangor, Me., 1906-7. Melville A. Sinclair, Superintendent.

A notable feature in this report is the statement that for ten consecutive yars all water rates have been collected in full and for the past two years this has been accomplished without shutting off any service for nonpayment.

The net cash receipts from water rates for the past year were $73,445, an increase of about $3,000 over the previous year. The bills of charitable and other institutions remitted by the council amounted to $1,556, and water is furnished free for public purposes to the estimated amount of $14,350, of which sum $10,288 is for fire protection. Apparently the only offset to this is an appropriation of $4,000. The water revenues paid a street maintenance charge of $13,145, a construction account of $12,982 and an interest account of $31,437, in addition to the maintenance and operation accounts of the works, amounting to $17,316. The credit balance seems to be transferred to city funds. There would seem to be an excellent opportunity to readjust payments so that they would be equitably distributed between city and water consumers, which would probably result in reductions in rates.

The report is silent regarding amount of indebtedness, except so far as it may be indicated by the amount paid for interest, and if there is any arrangement for a sinking fund it is not indicated. The report would be improved in this and some other points if the standard form of summary of water works statistics were used.

Annual Report of the City Engineer, Newton, Mass., 1906. Irving T. Farnham, City Engineer.

The special work of the office in 1906 included work on the abolition of grade crossings, the construction of a new bridge over a branch of the Charles river and plans and construction of a new bridge over the Charles river at Concord street, both paid for in part by Newton and in part by other corporations.

On the grade crossing work the city expended in 1906, $159,679 and the railroads expended $224,824. The total expenditures to 1907 have been $287,934 by the city and $391,507 by the railroads or $679,441 in all. These expenditures apparently will be redistributed so that of the $672,849 allowed by the auditors, the railroads will pay $437,640, the city of Newton $82,227 and the State of Massachusetts $152,982.

The report contains a number of photographs of streets before and after the grade crossing work was done, which show the great improvement in appearance as well as in safety and convenience. In all the cases shown the tracks were depressed and the roads slightly raised.

In the report is used the form of summary of sewerage statistics recommended by the sanitary section of the Boston Society of Civil Engineers, which is similar in form and content to the standard form of summary of waterworks statistics.

Thirty-Third Annual Report of the Board of Public Works of Grand Rapids, Mich., for year ending March 31, 1906.

The year for which this report is made is said to end March 31, 1906, the date line of the letter of transmission to the city council is December 14, 1906, and the report is received in this office in June, 1907, indicating considerable deliberation in all stages of its progress.

A remarkable feature of the report is the method of making the inventory of the present value of the various parts of the waterworks and of the value of the city's bridges. In the first place durations of life of the various parts are assumed and rates of interest on sinking funds to replace them at end of period. Thus mains are assumed to last 100 years and sinking fund interest is assumed as two and one-half per cent. Buildings and reservoirs are given 50 years life with 3 per cent. interest and pumps, boilers, iron standpipe and intake, 30 years life with three and one-half per cent. interest on sinking fund.

A table is computed for the pipe system with a line for each year. Thus the original cost of the pipe laid in 1873 was $33,001.07. Of this

pipe $360.89 worth has been removed, leaving $32,640.18 worth still in use. One dollar a year compounded to the end of the 100-year life of the pipe at two and one-half per cent. equals $444.37, so that the amount to be put by each year for the sinking fund to replace the pipe at the end of 100 years is $32,640 divided by 443.37 or $73.61. The present age of this pipe (end of 1905) is 32 years. One dollar a year compounded for 32 years equals $49.32. Therefore $73.61 a year compounded for 32 years equals $3,630.45 which is assumed to be the same as the total depreciation to this date. The remaining value at this date is the first cost less this depreciation, or $29,009.73.

The same computation is made for the pipe laid each year. The depreciation on $1,035,661 worth of pipe in the ground, thus obtained, is $40,662, and the present value is $994,999.27.

In the same way the parts of the pumping station added each year in a permanent way, running as low as $16.46 in one year and making a total of $69,936.87 are estimated to have a life of 50 years and an interest return on sinking fund reserve of three per cent., so that the total depreciation is $16,708.69 and the present value $53,228.18.

Machinery having an estimated life of 30 years, that over 30 years old, about $23,000 worth, is assumed as worthless. The total cost of machinery has been $175,686.02, the total depreciation is computed as $71,280.67 and the present value $104,405.

At the end of the assumed life of a portion of a plant the charges for depreciation made against the current revenues should wipe out the value of the plant ready to start anew, or the proceeds of the sinking fund at same time should meet the total cost of the plant, not including interest, so that at that time either method of meeting the problem reaches the same result. At any intermediate date the conditions are different and there are opportunities for much difference of opinion as to the method of computing present value of plant above described.

Fortieth Annual Report of the Commissioners of Waterworks, Erie, Pa., 1906. Clark Olds, Pres.

The report contains reproductions of the plans for the new intake from Lake Erie, the settling basins on Presqu, Isle and the steel intake pipe, and an emergency intake in Erie harbor. The total contract price for the work is $187,303.58, and $122,384.97 has been paid for work done. The contract will probably be completed this year, being about a year later than was expected.

The Commissioners kept a book account with the city of Erie showing the balance due the city from the previous year, probably an account of bonds sold for construction, interest on quarterly balances, office rent in city building and supplies, and charging the city with sinking fund payments and free water furnished.

The free water amounts to $38,448, and the total reduction in indebtedness of the works to the city is about $40,000 for the year. The report does not use the standard form of summary of waterworks statistics, but it shows unusual thoroughness in keeping accounts and making classification of receipts and expenditures.

Fiftieth Annual Report of the Controller of Detroit, Mich., 1905-6. Richard P. Joy, Controller.

The 427 pages of this report are sufficient to give room for a most elaborate and most satisfactory detailed and classified statement of the financial operations of the city. About 160 pages are devoted to the proceedings of the city council and the board of estimate upon the department estimates, leaving about 265 pages for the report proper. The present controller is introducing some improvements in details which will make the report even more valuable.

The city has a sinking fund for retiring bonds as they become due. This fund amounts to more than $2,500,000 and it is invested in the special assessment bonds for street and sewer improvements, of which it purchases all that are issued and they bear four per cent. interest, also in public improvement bonds and bonds of the county, the water department and bonds of other cities and towns, bearing three and one-half to five per cent. interest. All except the special assessment bonds have been purchased in the open market at prices which make the interest net from 2.55 to 3.42 per cent. interest, averaging 3.36 per cent.

An interesting table gives the per capita cost of government for the year, based on an estimated population of 400,000. The total cost is $14.65 per capital per year, of which $11.60 is for maintenance and $3.05 for improvements. Education cost $2.96 for maintenance and 81 cents for improvements; protection of life and property (fire and police), $3.33 for maintenance and 19 cents for mprovements. The figures run down from these through highways with total of $1.91; general

government, $1.37; health and sanitation, 78 cents; interest on public debt paid, 70 cents; principal of public debt paid, 68 cents; municipal industries (water, light, asphalt repair plant), 53 cents; charity, 17 cents; tax refunds, 5 cents.

The department audited and paid 17,713 vouchers, by 11,351 warrants, aggregating $6,767,547.86, of which $3,515,124.28 was for pay rolls.

New Publications.

Reinforced Concrete. By Albert W. Buel, C. E., and Charles S. Hill. Second edition, revised and enlarged. Cloth, 499 pp. Engineering News Publishing Co., New York City.

Mr. Buel seems to have succeeded to the editorship of this book, a notice of the first edition of which was given in MUNICIPAL ENGINEERING, vol. xxix, p. 54. The inaccuracies and failures of various statements to agree, there suggested, have been reconciled at least in part or more fully explained, so that the first part on methods of calculation is a safer guide than it was in the first edition.

The new matter in the first part includes Hatt's, Turneaure's and Talbot's tests of reinforced concrete beams and the tables, formulae and diagrams derived from them. The tests made by the Chicago, Milwaukee and St. Paul railroad are also included. The older formulae and the new are now classified as theoretical, straight line formulae, developed by the author; practical straight line formulae, Thacher's; parabolic formulae by Talbot and by Hatt, and Goldsmith's formulae. This gives the reader an opportunity to make his choice between formulae and the information whereby he can classify his results. As the author says, this is probably the best that can be done at the present time, the mass of data not being as yet complete enough to make it possible to devise one formula which will suit any large proportion of engineers.

In the first edition the second and third parts, giving representative examples of design and methods of construction, were prepared by Mr. Hill. In this edition Mr. Buel has rewritten and brought to date the chapters on reinforced concrete foundations and reinforced concrete in building construction. In his preface he pleads lack of time to bring the remainder of the chapters down and they appear the same as in the first edition. As a consequence, some new developments in building construction, reinforced sewers, culverts, facing of concrete surfaces, etc., are not recorded. The demand for the book is so great that another edition will probably be called for soon and possibly the editor will be able to revise the whole book for that edition.

Appendices give Prof. Talbot's tests of beams made in 1905; results of tests of plain and reinforced columns at the Watertown arsenal in 1905; and a paper by Richard T. Dana developing methods, formulae and diagrams for proportioning for various purposes.

The American City: a Problem in Democracy. By Delos F. Wilcox, Ph. D. The Citizens' Library. 423 pp. Cloth, $1.25 net. The Macmillan Co., New York City.

The author gives in this volume a smoothly flowing stream of talk upon the general features of municipal government in this country, which should be interesting to those who follow the lines of activity of the American Civic Association.

The growth of the American ideas of municipal government is sketched in the first chapter. The defects in the ordinary understanding of the uses of city streets and the best methods of controlling them are clearly shown. There is some attempt to show the errors committed in regard to the control of public utilities. The inadequate compensation for franchises is particularly well shown. Civic education is the title of a long chapter with a little practical value. The idea of the chapter on control of leisure is excellent, and suggests the principles of the control of saloons and vicious resorts and substitutes for some of their functions which the municipality should make, but does not.

The chapter on municipal insurance treats of the police, fire and health departments and the various methods in use for managing and neglecting them. In the chapter on civic co-operation the main subject is the contract versus the direct system of doing municipal housekeeping. The value of the public school building as a civic center, and of having such local centers of civic life specially provided in addition, is well shown.

The chapter on the responsibility of the people for the conditions in the city is convincing, but is not forcible enough to make a strong and lasting impression. That on official responsibility is not as complete as it might be. The case for the Federal system of municipal government is well put, but the best examples of successful operation are not given, and those which are given are not well correlated. A similar lack of force is felt in the chapter on municipal home rule.

Municipal revenues and municipal debts are considered somewhat superficially in two chapters, and the book closes with a short chapter on the application of the "Municipal Program" of the National Municipal League.

ORGANIZATIONS AND INDIVIDUALS

Concrete Dwellings—American Society of Civil Engineers—Technical Meetings—Civil Service—Engineering Schools—Personal Notes.

Plans for Concrete Dwellings.

The committee of the Association of American Portland Cement Manufacturers on competition designs for suburban dwellings in concrete made its report of the results of the competition under date of May 22, but the printed copy of the report with reproductions of drawings and descriptions of designs was issued about two weeks later.

A committee consisting of two architects and an engineer conducted the details of the examination under the competition and made a report without knowledge of the names of the contestants. The Association's committee supplied the names from the sealed envelopes on file and published the reports from which the following extracts and information are taken:

After careful consideration of the designs and their explanatory statements, the awards have been made with regard to first, excellence in artistic quality; second, convenience of floor arangements and third, economy of construction.

The number of designs submitted in the several classes is as follows:

Class A 1	42 designs
Class S 1	13 designs
Class A 2	37 designs
Class B 2	9 designs
Class A 3	85 designs
Class B 3	21 designs
Excluded	1 design
Total	208 designs

Many designs had to be set aside as being not only too costly but also not adapted to such diminishing (which might be described as as "photographing down") as would render them possible for the sums named.

A very general lack of familiarity with possible surface finishes and textures in concrete and the methods of securing them was found. Some of the best designs have fallen short in this respect. A great number of the designs have appreciated the necessity of extreme simplicity of exterior treatment in monolithic construction, while others, whose designs in monolithic construction have many points of excellence, show lack of practical experience by the use of too many corners, angles and projections.

The specifications have in many cases been less complete than could have been wished, but on the whole answer the requirements of the program.

The competition has been productive of an entirely satisfactory result in the high grade of a greater proportion of designs than would be naturally expected.

The prize designs were each criticised in a few well-selected sentences.

The prize winners were as follows:

CLASS A-1.

First Prize—Eugene Ward, Jr., 11 E. 24th St., New York.

Second Prize—David A. Clous, 1 West 34th St., New York.

Third Prize—L. B. Abbott, and F. H. Bond, Jr., 122 Ames Bldg., Boston, Mass.

Honorable Mention—Geo. S. Idell, 1117 Harrison Bldg., Philadelphia; James H. Van Booskirk, 923 Lumber Exchange, Minneapolis, Minn.

CLASS B-1

First Prize—Andrew Lindsay, 64 Center Ave., New Rochelle, N. Y.

Second Prize—Geo. S. Idell, 1117 Harrison Bldg., Philadelphia.

Third Prize—Grant M. Simon and Abram Baston, 1524 Chestnut St., Philadelphia.

Honorable Mention—George B. Eick, 175 Dearborn St., Chicago, Ill.

CLASS A-2

First Prize—Albert G. Hopkins, 15 Beacon St., Boston, Mass.

Second Prize—Frank H. Hutton, Arthur Francis Buyo, 63 William St., New York.

Third Prize—Grant M. Simon, Abram Baston, 1524 Chestnut St., Philadelphia.

Honorable Mention—Mellon & Meigs, 1420 Chestnut St., Philadelphia.

CLASS B-2

First Prize—Andrew Lindsay, 64 Center Ave., New Rochelle, N. Y.

Second Prize—L. B. Abbott, F. H. Bond, Jr., Boston, Mass.

Third Prize—Lindley Johnson, Harrison Bldg., Philadelphia.

CLASS A-3

First Prize—W. Cornell Appleton, Newton Center, Mass.

Second Prize—Albert G. Hopkins, 15 Beacon St., Boston, Mass.

Third Prize—L. B. Abbott, F. H. Bond, Jr., Boston, Mas.

Honorable Mention— J. Lovell Littell, Jr., 15 Beacon St., Boston, Mass.; Albert C. Wiser, 146 111th St., New York.

CLASS B-3

First Prize—Eugene Ward, Jr., 11 E. 24th St., New York.

Second Prize—Benjamin Proctor, Jr., 8 Exchange Place, Boston, Mass.

Third Prize—W. Cornell Appleton, Newton Center, Mass.

Mr. Louis H. Gibson has presented in an article elsewhere in this number some of the most striking of the designs presented.

American Society of Civil Engineers.

The thirty-ninth meeting of the American Society of Civil Engineers will be held in Mexico City, Mexico, beginning July 8. A number of excursions and entertainments have been arranged during the sojourn of the party in Mexico. A large number of topics have been selected for general discussion at the convention, and discussion upon them is invited from all members, whether they attend the convention or not. Discussions in writing, forwarded to the secretary, will be presented at the meetings, and subsequently published. Several of the subjects have been selected after conference with members of the society in Mexico, with the special view of giving attention to topics which are of general interest to the engineers of that country. The topics selected are as follows:

Is it a better policy to purchase and control water-sheds, thereby preventing the pollution of impounding reservoir supplies, or to suffer a certain amount of pollution of such supplies, relying upon filtration to correct the effects thereof?

What is the best system of construction for foundations of heavy structures on ground such as that of the City of Mexico, which is an alluvial deposit about 300 feet in depth, and similar in character to that at New Orleans.

Will iron or steel used in foundations, independently or in combination with other materials, last indefinitely when in direct or indirect contact with water?

Will the strength and durability of concrete in foundations be affected if before setting there is: (1) an excess of water; (2) lack of compression; (3) too rapid desiccation?

Will the paving materials of the present be used in the construction of the pavements of the future?

What are the factors which determine the maximum economical grade for electric railways?

In establishing direct lines with heavy grades, under what conditions will it be found practicable to use electric locomotives and gas engine generating stations, rather than traction by steam locomotives?

What is the best apparatus and most economical system for cleaning producer or furnace gas, to be used in gas engines?

To what extent is ordinary producer gas, made for bituminous coal, used in gas engines, and what practical results have been obtained by any methods for removing tar or soot?

Technical Meetings.

The convention of the National Electric Light Association was held in New York City, June 4, 5, 6, 7 and 8. Officers for the ensuing year were elected as follows: President, Dudley Farrand, Newark, N. J.; first vice-president, Alex Dow, Detroit, Mich.; second vice-president, W. C. L. Eglin, Philadelphia; secretary and treasurer, M. W. Freeman, Brooklyn, N. Y.; assistant secretary and treasurer, Miss Harriet Billings, New York City; master of transportation, George F. Porter, New York City; insurance expert, Wm. H. Blood, Jr., Boston. The date and place of the next meeting will be decided upon later during the year.

The seventh annual convention of the Union of Canadian Municipalities will be held in the Twin Cities of Fort William and Port Arthur, Ontario, August 13, 14, 15 and 16. W. D. Lighthall, secretary-treasurer, Port Arthur.

The seventeenth annual meeting of the Municipal League of Indiana was held at Logansport, Ind., June 18, 19 and 20. A discussion on the "Needs of Municipalities" was led by Hon. Joseph Murphy, mayor of Wabash. Mayor Roy L. Shattuck, of Brazil, delivered an address on "The Cities and Towns Law; Its Amendments and Applications." The officers of the league are: President, J. Fred France, Huntington; vice-president, B. R. Russell, Crawfordsville; second vice-president, Geo. A. Carr, Greenfield; secretary, John F. Taggart, Richmond; treasurer, L. W. Mellette, Elwood. The chairmen of sections are: Executive, J. Fred France, Huntington; legislative, R. O. James, Vincennes; legal, W. W. Moffett, Vincennes; police, George A. Har-

rison, Lafayette; clerical, A. A. Glenn, Noblesville; engineering, J. S. Shannon, Noblesville.

The annual meeting of the International Association of Municipal Electricians will be held at Norfolk, Va., August 7, 8 and 9. Frank P. Foster, secretary, Corning, N. Y.

The New York Electrical Society held its annual meeting June 10 at the Engineering Societies Building, 29 West Thirty-ninth street, New York City. Officers were elected as follows: Albert F. Ganz, president; Augustus Post, Theo. Beran, W. L. Conwell, vice-presidents; George H. Guy, secretary; H. A. Sinclair, treasurer.

The Illuminating Engineering Society will hold its meeting at Boston, Mass., July 30 and 31. Those attending can avail themselves of the low rates for Boston's "home-coming week." John Campbell, 729 Old South Building, Boston, is chairman of the convention committee.

U. S. Civil Service Examinations.

The United States Civil Service Commission will hold examinations at the usual places as follows:

July 3—Nautical expert in hydrographic office of navy department at $1,000 a year.

July 10, 11—Second assistant chemist in engineer department at large, for duty at Washington, D. C., filtration plant, at $1,000 a year; topographic draftsman, at $1,000 to $1,500 a year, and copyist, topographic draftsman, at $900 to $1,500 a year; first vacancy in hydrographic office of navy department, at $1,000.

July 17, 18, 19—Electrical engineer and draftsman in supervising architect's office at $1,200, and other prospective vacancies at $1,200 to $1,600 a year.

Summer Engineering School.

The summer session of Columbia University, New York City, offers courses in civil and mechanical engineering from July 9 to August 17. The courses include hydraulics, under Prof. W. E. Mott, of Massachusetts Institute of Technology; concrete, steel and other structures, by Prof. W. H. Burr; gas engines, experimental engineering and hydraulic laboratory, by Prof. Charles E. Lucke and assistants.

The courses are intended to meet a demand from instructors in engineering schools and technical graduates for opportunities to keep up with the latest advances in the science of engineering.

A School of Railway Engineering.

The University of Illinois has established a school of railway engineering and administration, with courses in railway civil engineering, railway electrical engineering, railway mechanical engineering and railway administration. The first two courses are intended for those who expect to enter the departments of maintenance of way and of motive power of steam railroads. The third course is for those preparing for service on lines using electric power, and the fourth course is for preparation for all other branches of railroad work except the legal work. Each course is four years in length and differs from the regular courses in parallel lines only in parts of the junior and senior years.

The university has issued an illustrated description of the courses and of the facilities which it offers, which will be sent on application to the registrar at Urbana, Ill.

Personal Notes.

Leander Schmidt has been reappointed city engineer at Cumberland, Md.

George A. D'Hemecourt has resigned as city engineer at San Diego, Cal.

C. W. Swearingen has been reappointed city engineer at Great Falls, Mont.

John W. Lux has been appointed president of the water board at St. Paul, Minn.

H. F. Schaefer has been appointed assistant engineer of the Baltimore sewerage commission.

Wilbur B. Thistlewood has been reappointed city engineer at Cairo, Ill., and his salary increased from $1,200 to $1,500 per year.

Walter A. Shaw, assistant city engineer of Chicago, has resigned to become president of the American Engineering and Construction Co.

Rudolph Hering, consulting engineer, New York City, has received the degree of Doctor of Science from the University of Pennsylvania.

Hon. David L. Griffiths, mayor of Springfield, Ill., was drowned June 12, while attempting to cross a submerged bridge nine and a half miles southeast of Springfield.

Charles H. Haswell, the well-known engineer and dean of the civil engineering profession, died May 12 as the result of a fall, but ten days less than 98 years of age.

Mayor McClellan, of New York City, has appointed Rudolph Hering, Samuel Whinery and H. deB. Parsons a com-

mittee to investigate the disposal of the refuse and garbage of that city.

Charles A. Caldwell, assistant professor of civil engineering in the Case School of Applied Science, Cleveland, Ohio, has resigned to become a member of the Cleveland Engineering Co.

Sir Benjamin Baker, one of the most eminent of English engineers, particularly well known in this country from his connection with the Forth bridge and the Assouan dam across the Nile. died May 19.

Greely S. Curtis, M. Am. Soc. C. E., fire alarm expert of the National Board of Fire Underwriters' Committee of Twenty, has opened offices at 17 Battery Place, New York City, as consulting engineer on municipal fire protective facilities.

C. G. Wells has resigned as city engineer at Galveston, Texas. A. S. Drewery has been elected superintendent and E. J. Owin chief engineer of the waterworks and sewerage department, and W. T. Scudder has been elected assistant city engineer.

George C. Whipple and James H. Fuertes, of New York City, R. S. Lea, of Montreal, and J. E. Schwitzer, of Winnipeg, have been appointed a board of consulting engineers to investigate and report upon a new water supply for Winnipeg, Manitoba.

The Municipal Civil Service of New York City will hold an examination July 31 of candidates for the position of assistant engineer to the board of water supply. The usual requirement of residence in New York state has been waived in regard to this examination.

John G. Ellendt has resigned as superintendent of construction for Frank B. Gilbreth and the Underwriters' Engineering and Construction Co., and will be actively associated as a partner with the Concrete Engineering and Supply Co., 1133 Broadway, New York City.

Freeland Howe, Jr., chemist and bacteriologist of the laboratories at Norway, Me., has been engaged to take charge of the water supply of Bangor, Me. The water is now treated by chemical filtration. The filter plant will probably be remodeled and and a sedimentation basin added.

George W. Tillson, M. Am. Soc. C. E., former chief engineer of the bureau of highways, borough of Brooklyn, has been appointed to the same position for the borough of Manhattan, to succeed G. W. Olney, resigned. John C. Sheridan, formerly assistant engineer under Mr. Tillson, has been appointed to succeed him in Brooklyn.

MACHINERY AND TRADE

Hercules Block Machines in Two Sizes.

The Hercules concrete block machine, manufactured by the Century Cement Machine Co., of Rochester, N. Y., has gained an enviable record during the past four years. It has been used by many of the largest constructing engineers throughout the world and is capable of producing the very highest grade of concrete stone in an unlimited number of sizes and designs. The reputation gained by it in the past has prompted a request on the part of many stone makers for a Hercules machine along similar lines but shorter in length. The manufacturers have placed on the market the Hercules Special in response. This machine will be equal to the regular Hercules, but will be limited to stones 32 inches long, whereas the regular Hercules is capable of turning out stone up to six feet long.

There is no doubt that the Hercules Special will fill a long felt want on the part of many prominent stone makers desiring a smaller and cheaper machine than the regular Hercules. Any size or design of stone can be made, from 3 inches to 32 inches long, and any height from 4 inches to 12, with widths from 4 to 16 inches.

The company reports a large number of orders already on file for the Hercules Special which is ready for delivery June 1st.

Medusa Water Proofing in India.

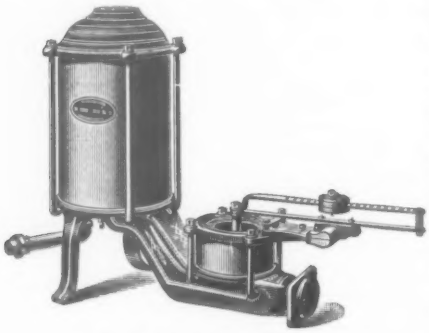
The Sandusky Portland Cement Company, of Sandusky, O., has just made

a shipment of a carload of their Medusa water-proof compound to the waterworks department, Municipality of Bombay, Bombay, India, and are advised that the material will be used in a cement mortar coat to be applied to the interior walls and floor of the Malabar Hill reservoir at that point.

This is probably the largest reservoir on the continent, and the adoption of this water-proof compound by the engineers in charge is a great compliment to the product.

An Economical Hydraulic Ram.

The accompanying drawing shows the essential features of the installation of the modern hydraulic ram as made by the Rife Engine Company, 111 Broadway, New York. It is claimed for this machine that it will pump with



RIFE HYDRAULIC RAM.

good efficiency against heads of twenty-five to thirty times the fall, the efficiency varying from 60 to 90 per cent., according to the ratio of the fall to the head on the pump. The machine will work on a fall of two or more feet and lift water twenty-five to thirty feet for each foot of fall. The company will give full information, and send catalogues on request.

The Claims Under the Bitulithic Patents.

As there appears to exist in the public mind, and in the minds of city engineers and officials, some misapprehension as to the scope of the Warren patents covering street construction laid by them under the name "bitulithic," it may be interesting to know at the present time just what is alleged to be covered by the patents in suit in the Owosso and Muskegon suits for infringement which have recently been tried.

Mr. Fred J. Warren, the original inventor and patentee of the bitulithic pavement, claimed that the addition made by him to the paving art, at the time his patents were issued, consisted in doing what had never before been attempted for the roadway of a street —that of mixing different sizes of stone for use in the wearing surface in such exact proportions that the spaces between the largest sizes of stone used would be filled by the use of stone of the next largest size that would fit in the voids, and so on down to an impalpable powder, thereby giving to the stone aggregate an inherent stability to withstand traffic independently of the cementing material used to coat the particles of stone and to fill the remaining voids in the mixture.

It is claimed that the application of these principles to the treatment of materials to be used in the wearing surface of a street pavement was new and patentable, and any specification which requires the use of different sizes of stone so graded, separated, proportioned and recombined before mixing as to produce this resultant stability in the mineral aggregate of the street pavement, independent of the cementing material used, is necessarily an infringement of the claims of the patents sued upon in these cases.

In other words, it is insisted, not only that the principle as applied to a street pavement was new, but in the specifications accompanying the patent it was pointed out for the first time how this principle could be practically carried out in the preparation of the material and the actual construction of the pavement.

Of course, the claims of these patents could not be infringed in the construction of any kind of block pavement, whether wood, asphalt, brick or stone. The only other kinds of modern street pavement known at the time these patents were granted were ordinary macadam, tar macadam and the standard sheet asphalt, and in none of these pavements were applied the principles used and called for by the Warren patents.

In the ordinary macadam pavement the different sizes of stone are used in layers on the street, the largest being on the bottom and the finer on top.

In the ordinary tar macadam pavement the stone is coated with tar, either before or after being spread on the street, and it is then laid and compressed as with ordinary macadam.

In the standard asphalt pavement

the two-inch wearing surface is composed of 90 per cent. ordinary sand, none coarser than one-tenth of an inch in diameter, and 10 per cent. asphaltic cement; so that at the time of the issuance of these patents there is no pretense that any known form of street construction even approximated the claims set up in the Warren patents.

No one will pretend that inherent stability in the mineral aggregate can be produced by the use of no material larger than sand; and no one will claim that inherent stability could be produced by the use of different sizes of stone placed upon the street in layers, the larger being at the bottom and the smaller on top, as is done in the ordinary macadam construction. Inherent stability can be produced only by the intermingling of the different sizes of stone in the same mixture in such exact proportions that the stones between the larger sizes used will be filled by use of the exact amount of the next smaller size that will fill these voids without pressing the larger stones apart.

It was upon the recognition of this principle and its application to the material to be used in the wearing surface of a street pavement that these patents claimed to be a new and useful invention never before applied to the paving art as it was then understood.

While it may be true that the principle was old, well recognized and thoroughly understood in its application to the building of a stone wall; that it was necessary to use the different sizes of stone "to break the joints" and to bridge over the joints between the larger sizes of stone, it was never imagined that this principle could be practically applied in the uses of broken stone, running from an inch and one-half in size down to powder, in the construction of the two-inch wearing surface for a street pavement, until the inventor of bitulithic, by the exercise of creative faculty, conceived the idea that this could be done, and claimed a patent for a street pavement constructed out of small particles of broken stone, put together on the same principle as that on which a solid stone wall is built.

The principle of the Warren patents covers the distinction, often overlooked, between solidity and stability. Solidity may be obtained by use of sand with an asphalt cement, but not necessarily stability; while stability may be obtained by the proper use of different sizes of stone, and still the structure might lack a great deal of being solid. Sand with water enough to fill the voids will make a solid mixture which can not be compressed without expelling the water. It will, however, by no means be a stable mixture, while stone of different sizes may be so placed as to have very great stability, though it would lack very much of being as solid as the sand and water.

To designate the kind of pavement construction under their patents, Warren Brothers Company coined the word "Bitulithic," and have had it copyrighted and registered as their trademark, to designate one of the brands of cement used by them in the construction of the pavement, as well as the completed pavement itself. The bitulithic pavement has now come to be one of the recognized forms of modern city pavements, having been adopted in more than 150 cities, extending from Glace Bay, Nova Scotia, to Portland, Oregon, and from Edmonton, Manitoba, to El Paso, Texas.

Tests of a Dumping Wagon.

Professor W. K. Hatt, of Purdue University, Lafayette, Ind., has made some interesting experiments upon a dumping wagon, from which some valuable results have been obtained.

For the purpose of these tests, a Troy bottom-dump wagon, No. 5 1-2, taken out of stock by the manufacturers, the Troy Wagon Works Company, Troy, Ohio, rated as capable of safely carry 8,500 pounds, or 4 1-4 tons, was used. The total weight of the wagon as tested was 2,410 pounds, or 1.2 tons. Of this weight 1,211 pounds was on the front end, as tested, and 1,199 pounds on the rear end. The weight of the body of the wagon was 1,386 pounds. The rear wheel was 4 feet 5 inches in diameter; width of tire, 4 inches; spokes, 2 3-4-inch size; hub, 9 1-2 by 11 1-2 inches; material, white oak. The wheel weighed 208 pounds.

The first test was made to ascertain the maximum or breaking load which the completed wagon would sustain.

In order to make this loading test, the wagon box was filled with sand, and the load was applied to the sand by mounting the wagon in a large testing machine.

This test developed the fact that it sustained a load of 72,500 pounds, or 36 1-4 tons, before it broke down. When failure did occur, it was not in the wheels, but in the body of the wagon, and was accompanied by a

slipping of the sideboards along each others, and by a yielding of the bolts joining the steel neck plates to the sideboards.

As the capacity of the wagon is figured as 8,500 pounds, the factor of safety against dead load is 72,500 divided by 8,500, or 8.53.

The wheels, axles and bolsters showed no signs of failure. The chains were intact. The bottom of the box had sagged 4.37 inches, but did not leak sand under the test. The dumping mechanism worked after the test and dumped the load.

The springs over the rear axle were uninjured. These springs serve a useful purpose in absorbing the severe jars and jolts which arise in service. They thus lead to a greater life of service of the wagon than would be the case in the absence of such springs.

The second test was made to determine the resistance of the rear wheel of a Troy dumping wagon, No. 5 1-2, against the strain that is brought on it when a wagon is resting on a side hill parallel to the top of the slope, or is sliding sidewise down a hill and meets an obstacle. Under these circumstances a force acts against the rim and tends to bend or break the spokes of the lower side of the wheel. The movement of the rim also bends the spokes on the upper side of the wheel.

The two wheels were mounted on a rear axle. The axle was reinforced by a wooden block fixed between the hubs so as to force the test to bend the wheels rather than to bend the axle. The wheels and axle were placed upright in the testing machine. The straining head of the testing machine then loaded the rim of the wheel in a direction parallel to the axle. The rim of the wheel and spokes were twisted with reference to the hub and axle, substantially reproducing the action and the kind of strain that results when a wagon is driven along the side of a hill. In service, the force which acts from the ground upon the rim of the wheel is inclined to the wheel. That component or part of it, however, which acts along the surface of the ground and twists the wheel is imparted to the rim by the straining head of the testing machine.

The amount of twist of the plane of the wheel under the load, during the test, was measured. The wheel carried a maximum load of 5,500 pounds, and the movement of the plane of the wheel with reference to the hub represented 5 inches movement at the end of the spoke.

Now, when the wagon has its full load of 8,500 pounds it is ready to upset when sidewise on a slope of about 31 degrees. The rear wheel then takes about 60 per cent. of the load. The force acting at right angles to the rim from the ground under these circumstances is 2,680 pounds. The factor of safety of the wheel is therefore 5,500 divided by 2,680, or 2.05.

It should be remembered that, in practice, a teamster never drives his loaded wagon on a side slope so steep that the wagon is on the verge of turning over.

The third test was made to determine the resistance of the rear wheel of a Troy dumping wagon against the strain that is brought about when a wheel is caught in a rut and when the horses attempt to turn it out of the rut. The rear of the wheel in service is held firm in the rut and the draft applied to the axle twists the hub and spokes against the resistance of the rim. The spokes break or pull out of the hub.

The rim of the wheel was held solid in a large clamp attached to the upright of the testing machine. The weight of the wheel rested on rollers, and the rim was free to move at the support, but not at the clamp. The loads were applied at right angles to the axle by the straining head of the testing machine. In service the rim is held in a horizontal clamp (the rut) and the loads (the draft) applied horizontally. In the test the clamp is vertical and the load is vertical. The action on the wheel is the same in each case. The leverage of the load was 43 inches from the center of the hub.

Loads were applied by increments, and the amount of the twist of hub with reference to rim was measured. The twisting movement was almost entirely in the spoke and only very slightly in the rim.

The maximum load was 3,650 pounds, with an accompanying twist represented by a two-inch movement at the end of the spokes. The upper spokes yielded more than the lower spokes, since the latter are strengthened by the dish of the wheel.

This load of 3,650 pounds, acting with a leverage of 43 inches, gives a moment of 13,080 feet pounds. Now, if the horses were to turn at right angles to the body of the wagon, their leverage would be 9 1-2 feet, since that is the distance from the center of the king bolt to the center of the rear wheel. The draft of a pair of heavy

horses will probably not exceed 800 pounds under the most favorable circumstances, hence the moment would be 800x9 1-2, or 7,600 foot pounds. The factor of safety against this strain is, therefore, 13,080 divided by 7,600, or 1.72.

It is, perhaps, needless to add that conditions so severe as this never occur in the use of wagons; for one wheel of a wagon is never clamped by a rut as firmly as it would be in a vise. Moreover, when one wheel is in a rut, the other wheel is ordinarily in another rut, so that the strain due to turning out is distributed over two wheels, instead of being concentrated on one.

The purpose of the fourth test was to determine the strength of the steel rear axle from Troy dumping wagon, No. 4 1-2, when loaded at bearings of the springs and supported in the hubs. The axle acts as it does in the wagon and is loaded and supported at the same points. The axle was of steel, 2 1-2x2 1-2 inches, square in cross section.

Hubs from which the spokes had been removed were mounted on the ends of the axle and were supported on rollers at the centers of the spokes. The rollers allow the hubs to move freely in and out and allow the axle freely to take the deflection under the load. In other words, there was no chain action in the axle. Thus supported, two loads were applied to the axle at the rear springs. The span between bearings in hub was 4 feet 4 7-8 inches. The loads 2 feet 8 1-4 inches apart. That is, each load was 1 foot 4 1-8 inches from the center of the axle.

The axle carried a maximum of 31,000 pounds.

The Troy Wagon Works Co., Troy, O., have published Professor Hatt's full report with the logs of the tests giving all the details, in a booklet which they will send on request. The report is illustrated with drawings showing the position of the wagon and parts under test in the testing machine. It deserves a place in the working library of every engineer and contractor.

Waterproofed Concrete in America.

Medusa water-proof compound, manufactured by the Sandusky Portland Cement Co., Sandusky, O., is being used and is specified for the exterior plaster of the Coliseum, Niagara Falls, N. Y., to prevent discoloration and efflorescence caused by the spray of the falls and the Crystal Ice & Storage Co., reinforced concrete tanks and the Hygeia Ice & Storage Co., at Poughkeepsie, N. Y. The new Baur Bros. Bakery at Pittsburg, Pa. has just been completed and was water-proofed throughout with this material. It is also being used in the American Car & Foundry Co's. plant at St. Louis, Mo., and the Pendleton Investment Co. in that city is using it in all concrete residences being erected by them. It was used in the floors of the Davis Estate Building in St. Louis with most excellent results. The new Olympic Club Building at San Francisco is having its swimming pool foundations and cellar entirely water-proofed with this material. Any one interested in waterproofed concrete work can obtain a most interesting pamphlet on the subject published by the company.

Forest Management.

The great and increasing value of forests, large and small, has begun to be realized by their owners. The proper management of such lands is becoming an important problem. Much experience is needed to obtain the most desirable results, either for beauty or profit, or both combined. The United States government is taking much interest in its forests, mainly for the general benefit to climate, streams and other lands, and some states are doing likewise. But private individuals must look at the problems from a different point of view, and must treat them in greater detail and with special reference to local and individual effects.

Forestry schools in this country have not been very successful as yet, for some reasons which need not be mentioned, so that for some time we must look to Germany, the home of forestry, for our expert foresters, and when we find one who has had ten or fifteen years' experience in this country in addition, he has the equipment in training and experience for the best work.

Forest estates, maintained in this country almost entirely for pleasure, may be made a source of profit at the same time that they are improved by proper attention. Timber tracts and wood lots can be greatly enhanced in value, and the product can be greatly increased in quality and value by the adoption of a definite plan for cutting and planting, and the revenue can be made continuous and increasing, rather than intermittent and vanishing. Many cities are now acquiring the watersheds for their water supplies, and can greatly improve them

and increase their minimum flow by proper attention to forestry. One of the safest investments for the future is in a well designed and executed commercial forest, the plan based on an intelligent study of conditions. The scientific study of the insects infesting trees and methods of preventing their ravages has brought out methods which can be applied commercially.

All these and other interesting and valuable subjects connected with scientific forestry will be discussed with those interested on request by F. R. Meier, consulting forester, 1 Broadway, New York, who combines with a German training more than twenty years' experience, sixteen of it in this country.

The Atkins Dump Wagon.

The Glen Wagon Company was incorporated in August, 1906, for the purpose of making the Atkins dump wagons and boxes, and a new factory was at once constructed which was deemed ample for the requirements of several years' business ahead. The first season, however, has demonstrated that the demand for these wagons is of such magniture that present capacity must be enlarged.

Many contractors who have heretofore used exclusively older makes of wagons have discontinued them, and are replacing with the Atkins Star wagon, and many dealers have taken up the sale of the Atkins wagon in their territory.

Features that appeal to practical contractors and teamsters are the excessive strength of the construction, particularly as applied to the neck, wheels and axles. These are the wearing parts of a dump wagon, and have been the weak links in the chain. Shortness and stiffness of the neck, reinforced as it is with heavy boiler plate with a larger amount of wood than usual, is claimed to make the wagon practically unbreakable at this point, while the quality of wheel stock and axles warrants a long-lived wagon, which can be put to the heaviest service without fear of result. The winding device is very simple, consisting simply of a three-inch arbor with ratchet and a dog released by a foot trip. The chain passes entirely outside of the box, there being nothing whatever inside the wagon. There is one single chain, holding up both doors and passing under and in front of the box over the arbor and held behind by grab hooks which permit the taking up of the chain to any shortness, thus regulating the width to which the doors can open, and permitting the load to be distributed along in a string if desired, instead of being dumped in a pile.

The wagon possesses a very short wheel base, and has direct draft from the axle, making this a very easy wagon on the team. It can be put into any excavation of any depth and drawn out over building stone or any obstruction, and, owing to the strength of the box construction and the rocking front gear, which permits the front truck to swing independently of the box, all strain and twisting is avoided. One of the chief features claimed for this wagon is its freedom from repairs on account of its great strength and small number of wearing parts. The makers have realized that the simpler a wagon can be made and the fewer parts, the better it is for the users.

A Growing Pipe Foundry.

The McWane pipe works, Lynchburg, Va., with offices at 220 Broadway, New York, have been in business comparatively but a short time, but the production has rapidly increased. On the cover of the diminutive "Monthly Pipe Parley," issued by the company in May, is a graphical illustration showing production, April, 1903, 117 tons; April, 1904, 515 tons; April, 1905, 1,031 tons; April, 1906, 1,164 tons; April, 1907, 3,376 tons. The booklet gives information about pipe prices, stocks, etc., and will be sent on request to any one interested.

Trade Publications.

The Union Sand and Material Company, Liggett Bldg., St. Louis, Mo., send a handsomely illustrated catalogue of Red Ring Portland cement, manufactured by the St. Louis Portland Cement Company, showing pictures of great St. Louis buildings in which the cement is used exclusively, also the settling basins, the Harlem street sewer and a Big Four railroad bridge.

The Peninsular Portland Cement Company, Jackson, Mich., issues an illustrated booklet showing structures of concrete, reinforced concrete and cement blocks, also sewer pipe in which Peninsular brand Portland cement has been used in large quantities.

The Garden City Sand Company, Security Bldg., Chicago, Ill., has among its publications a booklet on fire-brick, which is a full catalogue of all the

sizes and shapes of such brick furnished for the many purposes for which fire-brick are used.

The Goldschmidt Thermit Company, 90 West street, New York City, now supplies fire-brick molds for use in welding locomotive frames by the thermit process, and will send a pamphlet explaining the method of using the molds and containing lists of tools and appliances necessary and their cost in detail.

Catalogue No. 1 of the Newsom Crushed Stone and Quarry Company, Nashville, Tenn., which has heretofore being noticed in detail in MUNICIPAL ENGINEERING, shows many photographs of concrete block buildings erected by this company, and will be sent to any address for 25 cents.

The Maumee Chemical Company, 512 St. Clair Bldg., Toledo, O., issue circulars regarding their cement waterproofing, which is made in a dry, powdered form for addition to the cement and not for use in a wash.

Studebaker at the Jamestown Exposition is the subject of a recent handsomely and appropriately illustrated publication by the Studebaker Bros. Mfg. Co., South Bend, Ind., whose road wagons, automobiles, street sprinklers, garbage and public utility wagons were adopted for use by the exposition management.

The New Century system of fireproof construction is described in a booklet issued by the Banning Co., New York City, in the interests of the New Century Contracting Co., 1 Madison avenue, New York City.

The Barrett Manufacturing Company, New York City, prints in pamphlet form, under the title "The Dust Problem Solved," a part of J. W. Howard's address before the American Road Makers' Association, which was printed in full in MUNICIPAL ENGINEERING.

The Aberthaw Construction Company, 8 Beacon street, Boston, Mass., issue a booklet describing their method of taking general contracts for reinforced concrete with brick or timber.

The American Engineering Company, Indianapolis, Ind., issues a booklet on "Evolution of Transportation," to show its connection with interurban railway building.

The American Spiral Pipe Works, postoffice box 385, Chicago, Ill., issues a remarkably good catalogue of forged and rolled steel pipe flanges, special forgings and full size cross sections of flanges used in the different standards.

Trade Notes.

ASPHALT.

Montgomery, Ala.—The Memphis Asphalt & Paving Co., of Memphis, Tenn., which secured a contract for paving Hull St., in this city, with asphalt, will establish an asphalt plant here.

Seattle, Wash.—The question of establishing a municipal asphalt plant is urged by Councilman Mullen.

BRICK.

Caledonia, Minn.—The establishment of a sand lime brick plant is contemplated by George W. Metcalf.

Salina, Kan.—The plant of the Salina Vitrified Brick Co. has been purchased by D. A. Van Trine, F. C. Hadden and W. R. Whitney. The capacity of the plant will be increased by the addition of machinery and the construction of extra kilns.

Mecca, Kan.—The Yoke Vitrified Brick Co. has begun the construction of a new plant here. A. J. Yoke is president of the company.

Topeka, Kan.—The Topeka Vitrified Brick & Tile Co. has been organized here by H. S. Andrews, Wm. Moeser, A. Rodgers and others. The company will take over the property of the Rodgers brick plant, five miles west of this city.

CEMENT.

Nazareth, Pa.—The plant of the Nazareth Cement Company, which was completely destroyed by fire in 1906, is about completed.

Lewiston, Idaho—The Idaho Portland Cement Co. has been incorporated, and a plant for the manufacture of cement will be located on upper Snake river, where large deposits of granite, limestone and shale have been found.

Humboldt, Kan.—The Monarch Portland Cement Co. will build a second cement plant on Coal Creek, directly south of this city. The officers of the company are: President, O. M. Connet, Wichita; vice-president, Dempster O. Potts, Wichita; secretary, William Keith; treasurer, J. A. Murphy.

Black Oak, Lake Co., Ind.—The Black Oak Cement Works has been incorporated by John C. Seeberger, Matilda K. Seeberger and Michael J. Klitch.

Custer City, Okla.—The Portland Cement Co. has been incorporated by Christian Gauntentier, W. B. Mellon and Oda J. Gauntentier.

Glendora, Cal.—A company has been organized here for the purpose of building a cement plant, a vitrified paving brick plant and a brickyard, one-half mile south of this place, on land recently acquired from Dr. A. E. Englehardt.

Coffeyville, Kan.—The new plant being erected at Dewey by the Dewey Cement Co. will probably be in operation by August 1. The directory of the company are C. M. Ball, J. H. Keith, J. R. Mulvane, F. E. Tyler, F. H. Tyler, M. O. Williamson and F. L. Williamson.

Portland, Me.—The Portland Concrete Co. has been organized here for the purpose of manufacturing and dealing in concrete blocks, brick, tile pipe and artificial stone, with officers as follows: President, Joseph E. Hall, of Bangor; treasurer, Edward E. Reynolds, South Portland.

Harvey, Ia.—The Hawkeye Portland Cement Co. has been organized, and a

plant will be built near here. F. E. Wear, of Kansas City, is president.

Wathena, Kan.—(Special.) A. W. Themanson is in the market for machinery for a $200,000 Portland cement plant.

Des Moines, Ia.—The work of construction on the plant of the Iowa Portland Cement Co. was begun June 11.

Portland, Me.—The Bronson Portland Cement Co. has been organized, to mine, quarry, produce and deal in cement. President and treasurer, Wm. H. Jordan, Boston, Mass.

New York City—The merger of several cement concerns in the East, to be known as the National Cement Co., is proposed. C. L. Murphy, of Plainfield, N. J., who is president of the company, has transferred important cement lands near Carpentersville, N. J., to the new company, and a plant of 2,000 barrels capacity per day will be erected at Carpentersville.

St. Joseph, Mo.—The Missouri Portland Cement Co. has been incorporated, with head office at 112 Edmond St. President, T. J. Benkendorf; secretary and treasurer, H. W. McNutt.

San Jose, Cal.—The National Portland Cement Co., of this city, will erect a plant in this vicinity, according to press reports.

Augusta, Me.—The Berkshire White Portland Cement Co. has been organized here for the purpose of manufacturing and dealing in cement, artificial stone, etc. President, I. S. Kearney, of Augusta.

Jersey City, N. J.—The Occidental Portland Cement Co., of this city, has been incorporated by H. O. Coughland, L. H. Gunthey and J. R. Turner.

Catskill, N. Y.—The Seaboard Portland Cement Co. has been incorporated by John J. Donovan, 408 Manhattan Ave., New York City; Thomas H. Low, 326 West 113th St., New York City; N. A. Stancliffe, 219 West 104th St., New York City; Thomas E. Fitzgerald, Nassau St., New York City; M. J. Kelly, 140 Nassau St., New York City.

Wathena, Kan.—The Wathena Portland Cement Co. has been organized.

Vandorn, Ala.—The Vandorn Portland Cement & Coal Co., Ltd., has been organized here to establish a Portland cement plant and mine coal. J. L. Menes, of Shreveport, is president.

Okeene, Okla.—A proposition has been made to the citizens of this town to establish a cement plaster mill here.

CONCRETE BLOCKS.

Guthrie, Okla.—The New Era Concrete Block Construction Co., of Washington, D. C., and Guthrie, has been incorporated by V. C. Meyerhoffer, B. Bonnabel, W. E. Hayes and J. R. Hazard, of Washington, and H. W. Pentecost, L. E. Pentecost and G. V. Pattison, of Guthrie.

Hattiesburg, Miss.—The McInnis Manufacturing Co. has been incorporated and will engage in the manufacture of cement building blocks. A. K. McInnis and others are interested.

Ulen, Minn.—The Ulen Cement Stone Co. has installed a cement mixer and gasoline engine.

Wykoff, Minn.—J. A. Schroeder will engage in the cement walk business.

Roseau, Minn.—The Ekman concrete plant has begun operations.

Bristow, Pa.—P. C. Shaw has begun the manufacture of cement posts.

East Medford, N. Y.—The Concrete Block & Construction Co. has been incorporated by Samuel Sheemdelman, Wm. H. Agricola and Isaac Parsheldky, of Brooklyn, and will operate a plant here.

Colorado Springs, Colo.—The Square Deal Cement & Stone Co. has been incorporated by Peter Mortenson, A. Johnson and N. G. Hammon.

Collins, Miss.—The Concrete Building Co. has been incorporated by W. L. Magee, A. L. Speed and associates.

Charlotte, N. C.—The Charlotte Concrete Hollow Block Co. has been organized here, and has installed two Herring hollow block machines.

Trenton, N. J.—The Gibbs Cement & Concrete Block Co. has been incorporated to manufacture cement and concrete blocks, by W. Gibbs, A. Bower and W. Seiger.

Brinkley, Ark.—The Brinkley Concrete Block & Paving Co. has been incorporated and will install a concrete block and paving plant. D. S. Coleman, president.

Fremont, Neb.—Davis & Bryan will install a new concrete block plant.

Lincoln, Neb.—A new block machine has been installed by Reimers & Fried, who will manufacture sills, cornices, friezes and other ornamental work.

St. Joseph, Mo.—The St. Joseph Concrete Post & Block Co. has been organized to manufacture posts, blocks, bricks, etc., and to lay sidewalks, curbs and gutters, by William and Jester Ozenberger and Ernest Batchelor.

Springfield, Mo.—A new hydraulic stone company has been organized here to manufacture stone under the process of the American Hydraulic Stone Co., by Wm. Reps, W. S. Tucker, W. E. Jewell, A. Dark and others.

Mont Vale, N. J.—The Mont Vale Concrete Block & Construction Co. has been incorporated to manufacture brick, stone, cement, etc., by Frederick J. Pottinger, New York City; Francis Pottinger, Mont Vale, N. J.; William C. Owen, Brooklyn, N. Y.

Louisville, Ky.—The Gran-I-Tite Co. has been incorporated by Charles R. and John R. C. Long and Marshall E. Harding.

New York City—The Concrete Frame Co. has been incorporated for the purpose of making frames for the falsework to be used in the construction of buildings made of reinforced concrete, by Paul Kuhne, Walter F. Anderson and Paul Goepel, all of New York City.

Montreat, N. C.—The Montreat Concrete & Building Co. has been incorporated, to own and operate a concrete plant for making cement concrete blocks and other materials used in construction.

Ogden, Utah—The United States Concrete Co. has been incorporated, to manufacture concrete and cement, with Wm. Doyle as president and manager, and E. C. Olsen, secretary and treasurer.

Spokane, Wash.—Frank Schroeder will establish a plant for the manufacture of concrete blocks.

Red Wing, Minn.—The Lillyblad-Nelson Co. has been organized to do all classes of cement construction, by H. G. Lillyblad and E. G. Nelson.

Valley City, N. D.—W. J. Curren has engaged in the manufacture of cement building blocks. He purchased the business of Mason & Pederson.

Nevada, Ia.—J. C. Jacobson and Abel Thompson have established a cement block plant.

Underwood, N. D.—E. J. Scurlock and E. E. Potter, of Cherokee, Ia., have begun the manufacture of concrete blocks here.

Comfrey, Minn.—P. J. Miller will engage in the cement sidewalk business.

Hutchinson, Minn.—I. C. Christlieb has devised a cement drain tile for street crossings, to be made in three pieces, five feet long, which he believes will withstand the action of frost. M. C. Madsen, of this city, will make molds and manufacture enough of them to give a thorough test.

Hanska, Minn.—The Atlas Concrete Works has been organized here, with Gudman Anderson as president and Christ Moe as manager.

Emmetsburg, Ia.—A large cement tile plant will be installed by H. C. Shadbolt, who found his present plant inadequate.

Coon Rapids, Ia.—Garrison & Unger are erecting a plant for the production of concrete blocks.

Princeton, Minn.—R. W. Freer will install a concrete block machine and manufacture cement blocks.

PURCHASE OF MACHINERY.

Houston, Tex. — (Special.) — The Houston Cement Stone & Paving Co. has been organized here, succeeding Brace & Kirsten, who are retained in the firm. The company is in the market for all kinds of machinery, except block and brick machines.

Hamilton, O.—The board of public service rejected the bids submitted June 13, for furnishing coal handling machinery for the city's plants, and new bids will be asked. Bids were submitted by the Jeffrey Manufacturing Co. and the Link Belt Co.

Wathena, Kan.—(Special.)—A. W. Themanson advises that they are in the market for machinery for a $200,000 Portland cement plant.

Laurel, Mont.—(Special.)—W. J. Hay is in the market for a brick layer.

Schenectady, N. Y.—(Special.)—G. H. Abrams, 170 Jay St., is in the market for concrete mixers and block machines.

Houston, Tex. — (Special.) — The Houston Cement, Stone & Paving Co., 1010 Prairie Ave., advise us that they are in the market for machines for making sidewalk blocks or slabs. The company also desires the names of firms making sidewalk machines.

PURCHASE OF MATERIALS.

Laurel, Mont.—(Special.)—W. J. Hay is in the market for Portland cement.

LIGHT, HEAT AND POWER.

Niagara Falls, N. Y.—The Utility Construction & Operating Co. has been organized to distribute electrical power for light and commercial purposes. James E. Rock is president.

MISCELLANEOUS.

Lawrenceville, Ill.—The Lawrenceville Sewer & Drainage Co. has been incorporated to furnish sewerage and drainage, by W. S. Titus, O. V. Hardacre and J. B. Stout.

Kansas City, Mo.—The Imperial Roadway Paving Co. has been incorporated by Stephen F. Deal, George Ross, C. R. Hunt, John F. Pollock, W. B. Hill, E. M. Metcalf and W. W. Brady, of this city.

Rochester, Ind.—The Central Paving Co. has been incorporated by Helen Hoffman, Fred Hoffman and William A. Banta.

Topeka, Kan.—The Blanchard Construction Co. has been incorporated to engage in the construction of buildings, bridges, pavements and sewers, by W. A. Blanchard, Wm. Oldham, C. W. Swallow, G. H. Gurtler and Otis E. Hungate, of Topeka.

Dallas, Tex. — The Mexia Rock Crusher Co. has been incorporated by E. G. Meyers, F. M. Donnolly and Hans Helland, to install a rock crushing plant.

St. Paul, Minn.—The Thompson Sandstone Quarry Co. has been incorporated to produce and market building and paving stone, by W. R. and F. X. Duxbury and A. W. Thompson, of St. Paul, and C. O. Lindquist, of Minneapolis.

SEWER PIPE.

Fort Dodge, Ia.—The Lehigh Sewer Pipe & Tile Co. has been organized, and will establish a plant at Lehigh. The officers of the company are: President, E. J. Breen; vice-president, J. D. Spaulding, Sioux City; secretary, G. A. Lyons, Estherville.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

East Orange, N. J.—This city will expend $500 on an experiment in road making. The Good Roads Improvement Co. has made a proposition to cover 15,000 sq. yds. of streets with asphaltine, and if after 60 days the work is satisfactory, the city is to pay for it.

CONTEMPLATED WORK.

Austin, Minn.—Additional paving is proposed.

Bozeman, Mont.—Paving contemplated for Main st.

Chatfield, Minn.—Several streets will be graveled.

Anamosa, Ia.—Macadam paving is contemplated for Ford street.

Janesville, Minn.—Cement sidewalks will be constructed.

Dent, Minn.—The construction of sidewalks is contemplated.

Nebraska City, Neb.—Council voted to pave 6th and Iowa ave.

Deadwood Falls, Minn.—The con-

struction of sidewalks and sewers is contemplated.

Evansville, Minn.—The construction of sidewalks is proposed.

Iowa City, Ia.—Brick paving is contemplated for several streets.

Bricelyn, Minn.—The construction of sidewalks has been authorized.

Beardstown, Ill.—The question of street paving is being discussed.

Waterville, Minn.—Council has ordered the construction of sidewalks.

River Falls, Wis.—Cement sidewalks to the cemetery are contemplated.

Carpio, N. D.—The question of street improvements is being discussed.

Dixon, Ill.—The macadamizing of Galena ave. and 4th st. is contemplated.

Deadwood, S. D.—Sherman, Deadwood and Wall sts. will be paved with brick.

Aspen, Colo.—The question of building cement sidewalks is being discussed.

Marshall, Tex.—City council is preparing to construct 30-mis. of sidewalks.

Tremont, Ill.—Cement sidewalks will be constructed to replace the wooden walks.

Springfield, Mo.—Brick paving is contemplated on several streets. Mayor Blain.

Galena, Ill.—City council has granted a petition to pave Bench st. with brick.

Kingsley,, Ia.—Council has authorized the construction of permanent sidewalks.

Eaton Rapids, Mich.—Voted to issue $15,000 bonds for paving 4 blocks of Main st.

Cedar Rapids, Ia.—Brick paving is contemplated on S. 10th st. and Washington ave.

Minneapolis, Minn.—Paving is proposed for Douglas ave. from Colfax to Humboldt aves.

Bluffton, Ind.—Council has ordered the paving of two streets with coal tar macadam.

Fond du Lac, Wis.—Council has decided to pave six streets with asphalt on concrete base.

Aurora, Ill.—Ordinances have been passed for paving Claim st. and Iowa and Pennsylvania aves.

Denver, Colo.—Mayor Speer has decided to extend Cherry Creek Drive a distance of 1 mile.

Billings, Mont.—The question of paving and street improvements is under discussion.

Lawrence, Kas.—A resolution has been adopted to pave and curb Hancock st. F. D. Brooks, cy. clk.

Mason City, Ia.—The question of paving the street to the Great Western depot is being agitated.

Lockport, Ill.—The citizens are considering the question of constructing good sidewalks.

Iola, Kas.—The property owners on Lincoln st. from 1st to Cottonwood, have petitioned for paving.

Salamanca, N. Y.—The village board has voted to ask for bids for 1800-ft. of cement sidewalks.

Elgin, Ill.—Action will be taken soon on preliminary plans and specifications for paving in 1908.

De Kalb, Ill.—Brick paving is contemplated for 7th st. and Pleasant ave. A. R. Russell, cy. engr.

Rock Island, Ill.—Ordinances will be prepared for paving 7th and 18th aves. and 10th and 3rd sts.

Marion, O.—Ordinances have been passed for improving Senate, Silver and Prospect sts. and Toledo ave.

Independence, Kas.—An ordinance has been passed providing for the paving of Main and Sycamore sts.

Green Bay, Wis.—Cherry st. will be resurfaced. Cement walks have been authorized on a number of streets.

Dubuque, Ia.—The city has decided to expend $160,000 in brick paving and extending the sewerage system.

Bay City, Mich.—Police reports of the last year show over 200 bad sidewalks in this city in bad condition.

Victoria, Tex.—City council will enforce the sidewalk ordinance requiring all sidewalks to be of cement.

Menominee, Mich.—The defective walks will be replaced with cement. Main st. is to be paved with tar macadam.

Oshkosh, Wis.—Asphalt paving is proposed for Church st., macadam for Vine st. and macadam for Northwestern ave.

Lansing, Mich.—Plans and specifications have been approved for paving South st. from Washington ave. to Platt st.

Joplin, Mo.—An ordinance has been passed providing for concrete sidewalks on Melvin ave. J. F. Osborne, mayor.

Lock Haven, Pa.—Brick paving is contemplated for E. Church st. from Grove to Henderson sts. E. H. Welsh, cy. engr.

La Salle, Ill.—Will vote on an appropriation of $10,000 to construct a concrete roadway at the ravine on 1st st.

Neenah, Wis.—Brick paving is contemplated on N. Commercial st. Council is considering the construction of crosswalks.

Regina, Sask.—A petition is being circulated asking city council to use only creosoted blocks for street paving purposes.

Kane, Pa.—An ordinance has been passed to build and repair sidewalks and footways. Claude B. Gillis, chief burgess.

Luverne, Minn.—A resolution has been passed providing for the construction of concrete sidewalks. C. O. Wright, mayor.

Reno, Nev.—The county commissioners have decided to employ a road engineer to direct the road improvements contemplated.

Tacoma, Wash.—Plans have been completed for the proposed boulevard system. They provide for more than 40-mis. of driveways.

Danville, Ill.—An ordinance is being prepared for paving Main st. and constructing new cement sidewalks throughout this town.

Muncie, Ind.—The property owners on W. Jackson st. from Kilgore ave. to the White river bridge, have asked for brick paving.

Williamstown, Mass.—The board of selectment have been authorized to contract for paving the entire length of Cole ave. with Hassam.

Elizabeth, N. J.—An appropriation of $50,000, for the repair of the streets, has been requested of city council. Patrick J. Ryan, mayor.

St. Louis, Mo.—City council has passed resolutions for paving 10th, 11th, 7th and Union sts. and constructing a granitoid sidewalk on 9th st.

Elkhart, Ind.—A resolution has been adopted providing for the macadam-

izing of Lexington and E. Beardsley aves., W. Crawford and Grove sts.

West Chicago, Ill.—An ordinance has been passed to construct a cement sidewalk on Harrison st. from Clara to Sherman sts. G. A. Dayton, mayor.

Denver, Colo.—The boulevard system being planned by George E. Kessler, and designed to connect every park in this city, is assuming definite shape.

Portage, Wis.—The city is preparing to macadamize 7 blocks of Jefferson st. and to build cement sidewalks this summer. C. E. Coming, cy. engr.

San Mateo, Cal.—Estimates have been prepared for improving San Mateo drive with asphalt, concrete gutters and iron culverts. Cy. engr. Bromfield.

Elkhart, Ind.—The city engineer has been directed to prepare plans and specifications for paving S. Main st. from Prairie st. to the city limits.

Boston, Mass.—The finance committee of city council voted to recommend the passage of a loan order for $300,000 for laying out and constructing streets.

Oneida, N. Y.—Plans, specifications and estimates for paving William st. from Sherman to Railroad sts. have been approved by the bd. of public works.

Ogden, Ill.—An ordinance has been passed for the construction of cement sidewalks. H. C. Parris, vil. clk.

Bridgeton, N. J.—Mayor Hampton has vetoed the paving ordinance recently passed providing for bonding this city for $100,000 to pave a number of streets with asphalt block. He recommended that one or two streets be paved with asphalt, others with some less expensive material, and suggested that the work on the others wait until the city was in a better condition financially.

Hamilton, O.—A resolution has been adopted to pave Williams, Wood and 5th sts.

El Reno, Ok.—Bids will be asked soon for paving Rock Island and Bickford aves., Rogers, Hayes, Woodson, London and Wade sts. with brick on concrete base.

Whitehouse, N. J.—The Readington twp. com. has decided to straighten and macadamize the public road from the Somerset county line, through this town, to Flemington.

Los Angeles, Cal.—The Sunset Boulevard Improvement Association has appointed a committee to investigate the prices of brick paving, and asphalt with a concrete base.

Knoxville, Tenn.—Ordinances have been passed for paving six streets. The property owners on Magnolia ave. are considering the question of asking for 2-mis. of asphalt paving.

Somers Point, N. J.—Voted to issue $20,000 bonds for municipal improvements, including the paving of the streets with macadam, widening and paving of Harbor Lane, and other work.

Canton, O.—An ordinance has been passed providing for the construction of sawed stone or concrete sidewalks, vitrified block crosswalks, etc., on W. South st. A. R. Turnbull, mayor.

Cairo, Ill.—Special. Wilbur B. Thistlewood, cy. engr., says the city council has passed an ordinance ordering Washington ave. paved with brick, at an estimated cost of $129,623.97.

Pascagoula, Miss.—This city contemplates expending about $10,000 in paving with gravel and shell and constructing concrete and cement curb and gutter and sidewalks. M. M. Watkins, cy. engr.

Washington, D. C.—The Petworth Citizens' Association have recommended that the District Commissioners be asked to include in their annual estimates the macadamizing of Upshur and Varnum streets.

Colorado Springs, Colo.—The Real Estate Exchange has decided upon the business section bounded by Cascade and Nevada aves. and Bijou and Huerfano sts. for the construction of bitulithic, asphalt and Hassam paving.

Trinidad, Colo.—A council committee, composed of Dr. A. L. Epsey, Edward West, E. L. Wetzel, B. F. Hammerslaugh, and J. C. Huddleston, visited Pueblo June 18, to inspect the different kinds of paving in that city.

Racine, Wis.—The question of paving Main st. from 2nd to 6th, with brick or asphalt, is again being agitated. A resolution has been passed to pave 12th st. from Lake ave. to Center st. with macadam. P. H. Connolly, cy. engr.

St. Joseph, Mo.—Council has passed an ordinance appropriating $1,000 to pay for repaving 8th st. from Edmond to Charles. Paving and the construction of artificial stone sidewalks is contemplated for several streets. Cy. clk. Gates.

Waukegan, Ill.—Ordinances are being prepared for constructing about 5-mis. of cement sidewalks. Bids will probably be asked about September 1. Plans are also being prepared for paving Market st., Corey ave. and Steel Court with macadam. M. R. Miller, cy. engr.

Topeka, Kas.—The paving specifications prepared this year will probably provide for the use of two grades of brick. City Engineer Rogers believes that using brick for the lower course that is not perfect in shape if first-class in other particulars, will result in saving a small amount in paving work.

Duluth, Minn.—An ordinance has been passed providing that cement walks only shall be constructed on every street and avenue where the curb line is firmly established, and that all streets and avenues which are paved with creosoted blocks, sandstone blocks, brick, tar macadam and Telford macadam, shall be included in the cement sidewalk district.

CONTRACTS TO BE LET.

Newport, Ind.—Bids are asked until July 6 for constructing 2 gravel roads. H. T. Payne, co. audt.

Appleton, Wis.—Sealed bids are asked until July 3 for improving sundry streets. E. Williams, cy. clk.

Fond du Lac, Wis.—Bids are asked until Aug. 1 for brick paving. L. A. Pettibone, cy. engr.

Pratt City, Ala.—Bids are asked until July 3 for constructing cement sidewalks and curbing. Mayor.

Peru, Ind.—Bids are asked until July 12 for constructing 36 mis. of gravel roads. Bd. co. comrs.

Cincinnati, O.—Sealed bids are asked until July 10 for improving sundry streets. M. J. Keefe, clk. B. P. S.

Portland, Ore.—Sealed bids are asked until July 3 for building 10,150-ft. of road. Bd. co. comrs.

Wadsworth, O.—Sealed bids are asked until July 9 for curbing and paving High st. P. S. Goss, vil. clk.

Cleveland, O.—Sealed bids are asked until July 13 for grading and draining Taylor road. A. B. Lea, co. engr.

Brazil, Ind.—Sealed bids are asked until July 5 for constructing a gravel road in Cass twp. James L. Burns, co. audt.

Appleton, Wis.—Bids are asked until July 3 for improving Oneida, Appleton and Washington sts. E. Williams, cy. clk.

Antigo, Wis.—Bids are asked until July 2 for 2,738-ft. of concrete curb and gutter. G. O. Palmiter, cy. clk.

Balls Bluff, Va.—Bids are asked until July 13 for constructing government roadway here. Major M. Gray Zalinski, Q. M.

Sewickley, Pa.—Bids are asked until July 2 for paving Centennial ave. with vitrified brick. Fred T. Martin, boro. engr.

Wapakoneta, O.—Bids are asked until July 6 for constructing Maier's Pike and Miller joint pike. W. H. Meyer, co. audt.

Salt Lake City, Utah—Bids are asked until July 5 (extension of time) for sidewalk extensions. Louis C. Kelsey, cy. engr.

Greencastle, Ind.—Sealed bids are asked until July 20 for grading, macadamizing and graveling a road. Clement C. Hurst, co. audt.

Pleasant Ridge, O.—Sealed bids are asked until July 8 for constructing artificial stone sidewalks. W .C. Davies, clk. vil. coun.

Crawfordsville, Ind.—Sealed bids are asked until July 20 for grading, macadamizing and graveling a road. Benjamin F. Carman, co. audt.

Snohomish, Wash.—Bids are asked until July 16 for grading, curbing and constructing cement sidewalks on 4th st. Co. coun.

Paoli, Ind.—Bids are asked until 1 p. m. July 3 for constructing roads. Seth Stratton, chmn. co. comrs.; Alvin B. Ham, co audt.

Des Moines, Ia.—Sealed bids are asked until July 3 for 696-lin. ft. of Portland cement curbing on E. 5th st. W. W. Wise, chmn. B. P. W.

Lancaster, O.—Sealed bids are asked until July 5 for 1,110.36-sq. yds. of brick sidewalk on S. Broad st. George Cunningham, clk. B. P. S.

Winona, Minn.—Bids are asked until July 8 for macadam paving, brick gutter and stone curbing on 7 blocks of Center st. H. B. Walling, cy. engr.

Milford Center, O.—Sealed bids are asked until 12 m. July 2 for curbing and paving Mill st. A. J. Huffer, vil. clk.; J. C. Kennedy, vil. engr.

Cape May, N. J.—Bids are asked until July 8 for cnostructing 3.455-mis. of road on Tuckahoe road. R. Fendall Smith, co. engr., Ocean City.

Findlay, O.—Bids are asked until July 20 for constructing 1 3-4-mis. of stone pike road. Isaac Hart, chmn. co. comrs.

Ft. Leavenworth, Kas.—Sealed bids are asked until July 17 for constructing granolithic walks, steps, curbs and gutters. Capt. J. E. Normoyle, Q. M.

Clarion, Pa.—Bids are asked until July 8 for 9,085-lin. ft. of curbing and 16,780-sq. yds. of paving on Wood and Main-sts. G. G. Sloan, boro. clk.

New Orleans, La.—Bids are asked until July 24 for the repair of artificial stone foot walks inside Annunciation Square. Charles R. Kennedy, cy. compt.

Bogota, N. J.—Bids are asked until July 2 for macadamizing and laying curb and gutter and flag walks on a number of streets. Peter F. Hopper, chmn. st. com.

Auubrn, Ind.—Bids are asked until 7 p. m. July 2 for paving 3 streets with asphalt on concrete base, with cement curb and gutters. E. O. Little, cy. clk.

Martinsville, Ind.—Sealed bids are asked until 2 p. m. July 2 for constructing 4 macadam roads. J. H. Blair, chmn. co. comrs.; B. E. Thornburgh, co. audt.

McKeesport, Pa.—Sealed bids are asked until July 2 for repaving Huey st. with vitrified brick, also for repaving Fawcett st. C. E. Soles, cy. controller.

Fort Leavenworth, Kan.—Sealed bids are asked until July 17 for constructing granolithic walks, steps, curbs and gutters here. Capt. J. E. Normoyle, Q. M.

Seattle, Wash.—Sealed bids are asked until July 6 for clearing, grubbing and constructing box drain. Also, regrading 3d and 5th aves. C. B. Bagley, secy. B. P. W.

Green Bay, Wis.—Sealed bids are asked until July 15 for paving E. Mason st., Ashland ave. and School Place with asphalt. John Gross, chmn. com. on sts. and bridges.

Cincinnati, O.—Sealed bids are asked until July 12 for constructing a concrete box culvert on Compton road, and for improving Springfield pike. Fred Dreihs, co. clk.

Petersburg, Ind.—Sealed bids are asked until 2 p. m. July 2 for constructing 1-mi. and 2,278-ft. of road in Washington twp. W. W. Shy, chmn. co. comrs.; D. R. Bilderback, co. audt.

Altoona, Pa.—Sealed bids are asked until July 6 for constructing a brick sidewalk with stone curbing in front of reservoir grounds, on 2d ave. S. M. Griffith, chmn. bd. water comrs.

Pine Bluff, Ark.—Bids are asked until July 6 for 17,000-sq. yds. of brick paving and 8,000-lin. ft. of combined curb and gutter on 2d ave. from State to Nebraska sts. Wm. J. Parkes, cy. engr.

Concord, N. H.—Bids are asked until July 5 for grading and resurfacing with broken stone 2,500-ft. of main road in Milton and 650-ft. of Main and portion of Central st. in Farmington. A. W. Dean, state engr.

Clinto, Ia.—Sealed bids are asked until July 12 for constructing cement sidewalks on the north and east sides of the high school and training school. A. H. Paddock, secy. bd. directors Independent School Dist.

Cleveland Heights, O.—Sealed bids are asked until July 16 for paving Taylor road with brick, bitulithic, macadam or telford macadam, constructing sidewalks and sewers. Wm. G. Phare, vil. clk., 204 Am. Trust Bldg., Cleveland.

New York City—Bids are asked until July 3 for furnishing gravel, crushed trap rock and trap rock screenings in parkways of Brooklyn, and limestone and limestone screenings in parks in Brooklyn and Queens boros. Moses Herrman, prest. parks.

Johnson City, Tenn.—Sealed bids are asked until July 4 for paving Main, Market, Roan, Spring, Tipton and Buffalo sts. with vitrified brick, bitulithic, Hassam or asphalt, concrete curbing, gutters and sidewalks, and 10,800-ft.

trunk and lateral sewers. E. E. Ellsworth, cy. recdr.

Racine, Wis.—Sealed bids are asked until July 13 for 570-sq. yds. of brick paving, 853-lin. ft. concrete curb and 2,133-sq. ft. of cement sidewalk on Freeman Court; 27,056-sq. yds. of brick paving, 12,813-lin. ft. concrete curb and 9,000-cu. yds. of excavation on Center st. P. H. Connolly, chmn. B. P. W.

Columbus, O.—Sealed bids are asked for constructing state highways as follows: Bryan, Williams co., July 2; Mansfield, Richland co., July 3; Cabridge, Guernsey co., July 9; St. Clairsville, Belmont co., 2 roads, July 10; Steubenville, Jefferson co., 2 roads, July 9; Chardon, Geauga co., July 16. Sam Huston, state highway comr.

Memphis, Tenn.—Sealed bids are asked until 12 m. July 2 for furnishing granite, limestone or Arkansas bluestone paving blocks; granite curbing, granite curb corners and granite crosswalks; vitrified pipe and specials; limestone macadam; Portland and natural cement; furnishing and spreading cementing gravel; furnishing and constructing combined concrete curb and gutter. J. J. Williams, prest. municipal comn.

CONTRACTS AWARDED.

Creston, O.—W. H. Dowell, of this city, was awarded the contract for paving Main st.

Lindsey, O.—The contract for paving Main st. was awarded to Witte & Magee, of Elmore.

Herkimer, N. Y.—The contract for bitulithic paving was awarded to Warren Bros., of Boston.

Kenmore, N. Y.—The contract for paving several streets here was awarded to Busch & Percival.

Toledo, Ohio.—H. P. Streicher & Co. have been awarded a contract for 7,000 sq. yds. of Acme asphalt.

Superior, Wis.—Russell & Holquist secured the contract for creosote block paving on John st. for $26,000.

Bloomington, Ind.—The contract for paving E. 8th st. with gravel was awarded to J. N. Blair, for $6,928.85.

Portland, Ore.—Contract for 20,060 sq. yds. of Bitulithic has been awarded the Warren Construction Company.

Brazil, Ind.—Hawkins & Son, of this city, secured the contract for constructing the Trout gravel road, for $7,490.

Lake Village, Ark.—The contract for constructing 1-mi. of concrete sidewalks was awarded to Blome & Co., of Chicago.

Springfield, O.—The contract for grading and graveling W. High st. was awarded to Thos. E. Wren & Co., for $1977.

Toronto, Ont.—A contract for 14,323 sq. yds. of bitulithic has been awarded the Warren Bituminous Paving Company.

Dixon, Ill.—J. W. Kelly was awarded the contract for 11,110-sq. ft. of cement sidewalk on E. River st., for $318.04.

English, Ind.—The contract for constructing turnpike roads in Sterling twp. was awarded to Fisher & Co., for $19,187.

Bayonne, N. J.—The contract for 4 blocks of brick and asphalt paving was awarded to Thomas J. McGovern, of Trenton.

Boston, Mass.—Contract for surfacing with bitulithic 2040 sq. yds. of asphalt foundation has been awarded Warren Brothers Company.

London, Ont.—The contract for paving Clarence st. with asphalt was awarded to the Barber Asphalt Paving Co., for $9,300.

Richmond, Va.—The contract for macadamizing 21 1-2-mis. of roads was awarded to Mundy Bros., of Wingina, Va., for $112,000.

Cass Lake, Minn.—The contract for constructing cement sidewalks was awarded the Occidental Sidewalk Co., of Minneapolis.

Caldwell, O.—The contract for paving Court House Square with brick was awarded to Chas. Berry, of Woodfield, for $10,076.

Ashland, O.—The contract for constructing rural road in Ashland co. was awarded to McArthur & Co., of Kenton, for $10,705.

Cuyahoga Falls, O.—The contract for paving N. Front st. with brick was awarded to John J. O'Neil, of Akron, for $16,102.10.

Millville, N. J.—The contract for establishing the grade of the streets of this place was awarded to Wm. Boardman, for $2,000.

Rochester, N. Y.—Warren Bros. Co., of Boston, was awarded the contract for paving Lake ave. with bitulithic, for $71,063.

Los Angeles, Cal.—The Western Paving Co. was awarded the contract for paving San Fernando st. with brick, at 34 cts. a sq. ft.

Cedar Falls, Ia.—The contract for structing 9 blocks of brick paving was awarded W. A. Bryant & Sons Co., for $26,739.05.

Denver, Colo.—The contract for constructing 8-mis. of sidewalks in North Denver was awarded to J. Fred Roberts, for $37,666.45.

Oshkosh, Wis.—The Barber Asphalt Paving Co. was awarded contracts for paving Main and High sts. at $2.30 and $2.35 respectively.

Los Angeles, Cal.—The contract for paving 5th street with asphalt was awarded to the Barber Asphalt Paving Co., for about $100,000.

Clinton, Ind.—The contract for paving 5 blocks of Main st. with brick was awarded to Harris & Dorsey, of Terre Haute, for $17,044.65.

Peoria, Ill.—Jansen & Zoellers were awarded the contract for the city's portion of the cement walks and curbing, at 11 2-3 cts. a ft.

Greensburg, Pa.—Stoner & Hebert secured the contract for 1-mi. of brick paving on Green and Chestnut sts. and Oakland ave., for $30,000.

Edwardsville, Ill.—Robert Hyten, city, was awarded the contract for constructing 12,000-ft. of granitoid walks, at 11 cts. per ft.

Seattle, Wash.—Contracts for regrading were awarded as follows: Westlake ave., H. Pederson, $16,378; Fairview ave., Ottosen & Jensen, $39,710.

Huntington, Ind.—The Western Construction Co., Lafayette, Ind., was awarded the contract for paving Marshall and Oak sts. and Salamonie ave.

Bridgeport, Conn.—The contract for paving Fairfield st. with wood blocks was awarded to Silliman & Godfrey, 1119 Broad st., at $3.11 a sq. yd.

Shenandoah, Ia.—Hamilton, Rankin & Schwartz secured the contract for curbing and grading Thomas and Sheridan aves. and Maple and Crescent sts.

Evansville, Ind.—Bedford & Nugent was awarded the contract for paving 15 alleys with brick, at prices ranging from $1.33½ to $1.43 a sq. yd.

Great Falls, Mont.—The Miracle Concrete Co., according to reports, has been awarded a 2-yr. contract for constructing concrete sidewalks here.

Minneapolis, Minn.—The contract for paving St. Peter st. and Central ave. with asphalt was awarded to the Barber Asphalt Paving Co., for $23,428.

Niagara Falls, Ont.—The contract for constructing permanent sidewalks on Victoria and adjoining streets was awarded to T. E. Ferris, for $2,563.

Monroeville, O.—The contract for constructing 600 ft. of brick paving on Main st. was awarded, June 17, to Lee & Griggs, of Clyde, O., for $3,622.90.

Cambridge, Mass.—Warren Brothers Company, of Boston, Mass., will construct 15,000 sq. yds. of bitulithic. This is the sixth consecutive year that the University City has laid this style of pavement.

Terre Haute, Ind.—Paving contracts were awarded June 11, as follows: Eagle st., Roberts & Co., city, $14,-948; Mulberry st., Meredith Construction Co., $14,258.

Muskogee, I. T.—The contract for constructing 75-blocks of brick paving here was awarded to the W. A. Stuckey Construction Co., of Coffeyville, Kas., for about $200,000.

Edwardsville, Ill.—John Hamm, of Litchfield, was awarded contracts for paving Vandalia st., for $20,659.80, and Hillsboro ave., for $21,250, in this city.

Rock Island, Ill.—The contract for paving 38th st. and 7th ave. with asphalt was awarded to the McCarthy Improvement Co., of Davenport, Ia., for about $64,000.

South Bend, Ind.—The Union Asphalt & Construction Co., of Indianapolis, was awarded the contract for paving Jefferson and Main sts, with asphalt, for $16,000.

Belvidere, N. J.—The Miles Tigne Contracting Co., Easton, Pa., was awarded the contract for constructing telford-macadam paving on Harmony road, at 58 cts. a sq. yd.

Hamilton, O.—The Andrews Asphalt Paving Co. was awarded the contract for paving N. B st. with brick and Maple ave. with asphalt, for $36,972 and $26,605 respectively.

Grand Forks, N. D.—The contract for repaving the business section of the city with creosoted wood blocks was awarded to the Kettle River Quarries Co., of Minneapolis, for about $200,000.

Decatur, Ala.—The contract for 57,-000-ft. of paving was awarded to the Southern Bitulithic Co., of Birmingham. This city will also build over 9-mis. of cement sidewalks this summer.

Boyertown, Pa.—The contract for paving Reading and Philadelphia aves. was awarded to Fehr & O'Rourke, of Reading, at $1.47 a sq. yd. for paving, 9 cts. a lin. ft. for curbing, or $32,378.-69.

Quincy, Ill.—The contract for grading 15th st. was awarded to Frederick Kordsiemon, at 18.9 cts. a cu. yd., and Henry Hummert secured the contract for grading Jackson st. for $153.30.

Moosejaw, Sask.—The Parsons Construction Co. was awarded the contract for constructing 104,406-sq. ft. of granolithic sidewalks, 11,020-ft. crossings, and 14,420-ft. of gutters, for $25,-786.

La Crosse, Wis.—The contract for constructing a cement sidewalk around the school house between 15th and 16th and Cass and Madison sts. was awarded to J. H. McHugh, at 9 cts. a sq. ft., or $814.32.

Louisville, Ky.—The Barber Asphalt Paving Co. was awarded contracts for paving Beech st. with asphalt at $2.08 a sq. yd. and paving 11 alleys with vitrified brick at prices ranging from $1.78 to $1.80 a sq. yd.

St. Joseph, Mo.—The contract for paving 24th st. with Hassam was awarded to Rackliffe & Gibson, at $1.50 a sq. yd. The Phoenix Brick & Construction Co. was awarded the contract for paving 23rd st. with brick, at $1.70 a sq. yd.

Alton, Ill.—Paving contracts have been awarded as follows: Pearl st., $1.29½ a sq. yd., Spring st., $1.33½, and $1.33, H. R. Wolf; 4th st., $1.27½ and 6th st., $1.27, Wolf, Maupin & Curdie; 4th st., $1.34½, P. B. Robertson.

Rochester, N. Y.—Paving contracts have been awarded as follows: Wellington ave., asphalt, Rochester Vulcanite Pavement Co., 27 Main E st., $20,-288; Hague st., Johnsonburg brick, F. C. Lauer & Sons Co., $18,099; Cayuga st., Calder block, $7,883, Belmon st., Calder block, $2,369, F. V. Brotsch.

Chicago, Ill.—Special. The contract for paving 10,000-sq. yds. in a system of streets in Ravenswood, a suburb of this city, was awarded to the Metropolitan Engineering & Construction Co., of this city. The company will use the Standard Asphalt & Rubber Company's Sarco brand of asphalt.

Freehold, N. J.—The contract for constructing the Colts Neck-Eatontown stone road, 3-mis. long, was awarded to J. F. Shanley & Co., of Newark, for $34,146. This company also secured the contract for resurfacing the Long Branch-Asbury Park stone road at 65 cts. a. sq. yd. and $2.25 per ton for 3-4-in. stone screenings.

Cadiz, O.—Special. Bids were submitted June 1, for 14,771-sq. yds. of brick paving, as follows: McLaughlin & Branson, Cadiz, 2 bids, $37,984.32 and $35,177.85; E. A. Freshwater & Son, Chester, W. Va., $34,439.43 and $28,678.74; Rosser & Maloney, Bellaire, O., $35,314.68 and $30,440.25; George B. Clifford, Martin's Ferry, O., $36,045 and $32,500.15; Dixon & Pickett, Martin's Ferry, O., $32,613.77 and $29,674.35; Rhinehart Bros., East Liverpool, O., $33,514.27 and $27,605.87; Warwick & Timmons, Cadiz, $29,514.42; Riggs & Sherman Co., engrs., Toledo.

Vincennes, Ind.—The contract for constructing concrete sidewalks and curbing on Main st. was awarded to Foulkes, Forbes & Co., of Terre Haute, at 10½ cts. for sidewalks and 45 cts. for curbing. J. P. Marsh secured contracts for concrete sidewalks on 3rd st., as follows: exca., 20 cts.; embankment, 20 cts.; gravel, 85 cts.; concrete sidewalks, 10 cts.; stone curbing, 43 cts.; alley crossings, 15 cts.; Center st., exca., 20 cts.; embankment, 20 cts.; gravel, 85 cts.; sidewalk, 10 cts.; stone curbing, 43 cts. J. P. Marsh also secured the contract for improving 4th st.

SEWERS.

CONTEMPLATED WORK.

Caneron, Tex.—A sewerage system is contemplated.

Wyandotte, Mich.—Voted to issue

$25,000 bonds for constructing a public sewer.

Cloquet, Minn.—This city has formed 3 sewer distircts.

Sheboygan, Wis.—A sewer is contemplated for Erie ave.

Bryant, Wis.—A sewerage system is to be installed.

Rochester, Minn.—Storm sewers are contemplated in Mayo Park.

Dickinson, N. D.—A sewerage system for the south side is desired.

Winnebago, Minn.—Will vote on the issue of bonds for a sewerage system.

Laurel, Md.—Plans for constructing a sewerage system have been completed.

Wichita Falls, Tex.—The citizens have decided to construct a sewerage system.

Whittier, Cal.—Voted to issue $95,000 bonds for constructing a sewerage system.

Wahpeton, N. D.—Plans for sewers in district No. 4 will be prepared by S. Crabbe.

Elgin, Ill.—Plans for a storm sewer are being designed by M. J. Tarble, cy. engr.

Orrville, O.—Voted June 11 to issue $55,000 bonds for constructing sanitary sewers.

Sunnyside, Wash.—Voted to issue $8,000 bonds for constructing a complete system of drains.

David City, Neb.—The question of constructing a sewerage system is being considered.

Centralia, Wash.—The question of constructing a sewerage system is being considered.

Sioux Falls, S. D.—The question of constructing a sewerage system is being agitated.

Colville, Wash.—Voted to issue $6,000 for constructing an outlet for the sewerage system.

Baden, Pa.—Plans are being prepared for constructing a sewerage system. J. P. Leaf, cy. engr.

Independence, Ia.—Council will hear objections July 8 on a proposed sanitary sewer project.

Peoria, Ill.—Bids will be asked for constructing the 4th st. sewer. Mayor Schnellbecher.

Akron, O.—City council is considering the question of constructing a sewerage disposal plant.

Somerville, Mass.—This city has appropriated $60,000 for constructing sewers. Fred W. Cook, cy. clk.

Waukegan, Ill.—Plans for the North Side sewer have been completed by Supt. of Pub. Wks. Miller.

Honeoye Falls, N. Y.—The question of constructing a sewerage and waterworks system is being discussed.

Two Harbors, Minn.—Will vote July 9 on the issue of $40,000 bonds for constructing sewerage system.

Okaloosa, Ia.—The construction of a lateral sewer from the canning factory to the filter beds is proposed.

Eaton, O.—The question of issuing $125,000 bonds for establishing a sewerage system will be voted on July 22.

Watertown, Wis.—Bids will be asked for soon for constructing a sanitary sewerage system. E. B. Parsons, cy. engr.

Detroit, Minn.—Plans for a sewerage system and septic tank have been prepared and a special election will be called.

Rye, N. Y.—Voted to expend $556,500 for constructing sewers, roads, firehouses, public park and other improvements.

Beatrice, Neb.—An ordinance has been approved providing for the creation of sewer district No. 11. C. L. Reed, mayor.

Lockport, N. Y.—The question of constructing a sewerage system, under plans prepared several years ago, is contemplated.

Jefferson City, Mo.—This city contemplates constructing a district vitrified pipe sewer system. E. F. C. Harding, cy. engr.

Fayetteville, Tenn.—The establishment of a sewerage system is recommended for this city by G. W. Kirkpatrick, of Jackson, Miss.

Blue Earth, Minn.—A petition has been presented to council asking for an extension of the sewer system to the east part of town.

Grandview, O.—Plans for a sewerage system and sewage purification plant are being prepared by E. G. Bradbury, 85 N. High st., Columbus.

Macon, Ga.—The construction of a sewer this summer between the Ocmulgee river and the new Georgia Academy for the Blind, is contemplated.

Rochester, N. Y.—An ordinance was passed June 11 for constructing a sewer system and pumping station for the 21st ward, at a cost of $122,000.

Fitzgerald, Ga.—Plans for constructing a sewerage system are being prepared, and will probably be submitted to council August 1. C. M. Wise, cy. clk.

Winston-Salem, N. C.—Will vote August 6 on the issue of $155,000 bonds for street improvements and the extension of the sewerage system. Mayor.

Carthago, Mo.—This city will readvertise for the construction of 5,000-ft. of vitrified pipe sewer in sewer district No. 6. L. Shannon cy. clk.

Perth Amboy, N. J.—The State sewerage commission has notified this city that it must build two separate sewers to drain the western part of the city.

Evansville, Ill.—Plans and specifications are being made for a sewerage system in the north and northeast portion of this city, and bids will be received about July 5.

Batavia, N. Y.—The plans prepared by Alexander Potter, of New York City, for a sewerage system for this city, have been approved and adopted by the sewer commissioners.

Chicago, Ill.—The proposition to construct a sewer in Western ave. from the drainage canal to W. 71st st. was approved by the bd. of local impvts. at a public hearing held June 12.

West Hartford, Conn.—The construction of a trunk sewer from Fern st. to Capitol ave., preliminary to constructing Park st. sewer system, has been authorized. A. B. Alderson, town engineer.

Indianapolis, Ind.—Plans have been completed for the longest sewer ever constructed in this city. It will cover 835 acres or about 200 city blocks, and will be more than 5 miles long, and will vary from 12-inch pipe to a 7-ft. brick sewer in size.

New York City.—The bids submitted June 14 for constructing the Gold st. branch of the relief sewer system in Brooklyn, were rejected and the work

will be readvertised. The closeness of the bids lead to the belief that collusion existed. The bids were as follows: Borough Constructing Co., $623,000; Jenks-Asserson Co., $626,000; John C. Green, $620,000.

CONTRACTS TO BE LET.

Independence, Ia.—Bids are asked until July 8 for constructing a sanitary sewer.

Cresson, Pa.—Bids are asked until July 10 for building sewers. Fred W. Hamburger, Ebensburg.

Boone, Ia.—Bids are asked until July 8 for constructing a county drain. E. F. Jones, co. audt.

Crookston, Minn.—Bids are asked until July 9 for constructing sewers. A. M. Childs, cy. clk.

Massillon, O.—Bids are asked until July 8 for constructing a sewer. W. P. Fox, clk. bd. education.

Frankfort, Ind.—Bids are asked until July 25 for building a sanitary sewer. Worth Price, cy. clk.

Estherville, Ia.—Bids are asked until July 10 for constructing a county drain. Roy J. Ridley, co. audt.

Seattle, Wash.—Bids are asked until July 6 for constructing a box drain. C. B. Bagley, secy. B. P. W.

Willoughby, O.—Sealed bids are asked until July 22 for constructing a sanitary sewer. C. C. Jenkins, vil. clk.

Hastings, Minn.—Bids are asked until July 8 for constructing sewers and water-works. Chas. Hankes, cy. clk.

Steubenville, O.—Bids are asked until July 15 for constructing a sewer in alley D. T. W. Vance, clk. B. P. S.

Cleveland Heights, O.—Bids are asked until July 16 for constructing sewers in Taylor road. Wm. G. Phare, vil. clk.

Harrisburg, Pa.—Bids are asked until July 5 for constructing a reinforced concrete sewer. D. E. Tracy, secy. B. P. W.

Piqua, O.—Bids are asked until Aug. 1 for furnishing quantity of 24 and 34-in. sewer pipe. W. B. Mitchell, clk. B. P. S.

Columbus, O.—Bids are asked until July 10 for constructing the East Side sewage pumping station. E. F. McGuire, secy. B. P. S.

North Battleford, Sask.—Sealed bids are asked until July 31 for the installation of a sewerage system. S. Cookson, secy.-treas.

Salt Lake City, Utah.—Bids are asked until July 5 (extension of time), for constructing sewer extensions. Louis C. Kelsey, cy. engr.

Pine Bluff, Ark.—Bids are asked until July 2 for constructing 16-mis. of drainage canals. A. M. Barrow, chmn. bd. directors.

New York City.—Bids are asked until July 21 for constructing sewers in a large number of streets in Queensboro. Jos. Bermel, prest. boro.

Tama, Ia.—Bids are asked until July 2 for constructing a reinforced concrete covering for a water way on State st. Jas. H. Willett, clk.

Collinston, La.—Sealed bids are asked until July 13 for constructing a drainage canal. Windsor Pipes, sec'y. bd. comrs. Coulee drainage dist.

Napoleon, O.—Bids are asked until July 8 for constructing a storm water sewer in Mary Dodd's second addition. F. W. Hilgendorff, vil. clk.

Elbow Lake, Minn.—Sealed bids are asked until July 3 for constructing 10-in. vitrified clay pipe sewer on Crocker st. W. W. Wise, chmn. B. P. W.

Greenville, Pa.—Bids are asked until July 2 for constructing 250-ft. of 20-in. terminal sewer and 3.17-mis. of sanitary sewers. J. M. Hittle, boro secy.

Madison, S. D.—Sealed bids are asked until July 8 for constructing a sewerage system for the Madison normal school buildings. E. C. Ericson, prest. bd. regents.

Harrisburg, Pa.—Sealed bids are asked until July 5 for constructing a reinforced concrete sewer and appurtenances from Paxton creek to 17th st. D. E. Tracy, secy. B. P. W.

Johnson City, Tenn.—Bids are asked until July 4 for constructing 5800-ft. 8-in. and 5000-ft. 18 to 24-in. tile or concrete trunk sewers. E. E. Ellsworth, cy. recdr.

Greenfield, Ind.—Bids are asked until July 3 for constructing a drain on Walnut st. and several alleys, and a sewer in N. Main, Hendricks, North and Broadway. Oscar O. Beaver, cy. clk.

Urbana, O.—Sealed bids are asked until July 15 for constructing the Mad river improvement, involving the removal of about 615,584-cu. yds. of material. C. S. Pratt, engr.; C. E. Russell, co. audt.

CONTRACTS AWARDED.

Amboy, Ill.—The contract for constructing a sewer system was awarded to M. Egan, Jr., for $7,021. 67.

Paris, Ill.—Ralph Baum was awarded the contract for the extension of the North Main st. sewer, for $4,000.

Norwalk, O.—The contract for constructing a sewer on Norwood ave. was awarded to Penny & Corron, of Lorain.

Houghton, Mich.—Jas. J. Byers & Co. seceured the contract for constructing sewers in West Houghton, for $19,-751.

Chattanooga, Tenn.—The West Construction Co. was awarded a contract, June 4, for constructing sewers, for $88,202.

Fond du Lac, Wis.—S. H. Cole was awarded the contract for constructing the 8th st. storm sewer, for $14,-425.80.

Dixon, Ill.—Paul G. Baxter was awarded the contract for constructing 6 blocks of sewer in Highland ave., for $3,040.

Forest City, Pa.—The contract for constructing sewers was awarded to Stephen Flanagan & Son, of Scranton, for $20,000.

Green Bay, Wis.—Contracts for constructing 15 sewers were awarded, June 12, to Herman Schaefer, and to Lagers & Kapinski.

Quincy, Ill. — Peter Simons was awarded the contract for constructing a brick storm sewer in 9th and Vine sts. for $4,239.

Lisbon, N. D.—The contracts for constructing sewers in dists. 1, 2 and 3 were awarded to Jas. Kennedy, of Fargo, for $26,500.

Morristown, N. J.—The contract for constructing a sewer system was awarded to Antonio Costa, of East Orange, for $153,279.31.

Seward, Neb.—The contract for constructing a sewer in the northeast part of town was awarded to Jacob Zeig, of York, for $3,865.44.

Norfolk, Va.—The contract for constructing a main sewer in the 7th ward

was awarded to Bryan & Co., of Jacksonville, Fla., for $68,000.

St. Louis, Mo.—The Pendergast Construction Co., 308 N. 6th st., was awarded the contract for constructing Harlem Creek sewer for $165,930.

Superior, Wis.—The contract for constructing a concrete sewer on Winter st., at the end of Howard's pocket, was awarded to G. Skamser, for $1,334.

Elkhart, Ind.—The contract for constructing a sewer in dist. No. 10 was awarded to the Northern Construction Co., of this city, June 19, for $62,370.50.

Denison, Ia.—A. J. Gary was awarded the contract for constructing a sewer in Washington ave. at 85 cts. a lin. ft. and one in Anthony st. at 55 cts.

Ansonia, Conn.—Edward Tracy, of Derby, Conn., was awarded the contract for building storm water sewers on Grove, Vine, 4th and Jackson sts. and Myrtle ave.

Parkersburg, W. Va.—The contract for the extension of the storm sewer in the 5th, 6th and 8th wards was awarded to the Brady Construction Co., for $8,890.24.

Des Moines, Ia.—The J. W. Turner Improvement Co. was awarded the contract for constructing the Ingersoll sewer extension, nearly 6-mis., at $2.447 a lin. ft. or $75,000.

Zanesville, O.—J. C. Williams has been awarded the contract for constructing sewers on No. 7th st. for $1,672.85, and T. M. Lynn the Howard st. sewer for $2,771.15.

Springfield, O.—Sewer contracts were awarded recently as follows: Main st. and Grape alley, Joseph Bolan, $1,601.40; Ferncliffe ave. and Park Place, Doyle & Cafferty, $2,903.

St. Paul, Minn.—John Lind, of this city, was awarded the contract for installing a sewer system at the State Fairgrounds, requiring 9,500-ft. inside and 6,500-ft. outside the grounds, for $29,895.

Oil City, Pa.—The contract for constructing a sewer in Holiday st. was awarded to Lampe & Burke, of Allegheny, for $2,315, and F. L. Mallery secured the contract for a sewer in Groff st. for $971.

Waterloo, Ia.—The contract for constructing about 5-mis. of sewer during the year was awarded to W. N. Dearborn, of Cedar Falls, for $93,219.50. The work wil include concrete and pipe sewers, 58 manholes, etc.

Springfield, O.—The contract for constructing an outfall sewer and temporary outfall for the sanitary system was awarded to Doyle & Caffery, of this city, June 4, for $34,669. Reinforced concrete will be used.

Chicago, Ill.—The contract for constructing a new sewer in State st. from 39th to 35th sts. was awarded June 22, to McCarthy & Cleary, for $228,000. The sewer will be 8-ft. in diameter and will be built of brick and cement.

Washington, D. C.—Bids were submitted June 15 for constructing 2 sewers, as follows: (a) R. J. Beal Construction Co., 1217 F. st., N. W., Washington, (b) Warren F. Benizer Co., Second and O Sts., S. E., Washington: Tenth st. Sewer: ordinary excavation, (a) $2.75; (b) $2.50; red brick masonry, (a) $17.50; (b) $17; vitrified brick masonry, (a) $26.50; (b) $26; concrete masonry "B," (a) $11.50; (b) $10.90; concrete masonry "C," (a) $10.80; (b) $10. 17th Street Sewer; excavation (a) $2.90; (b) $2.75; red brick masonry, $17.50; (b) $17; vitrified brick masonry, (a) $26.50; (b) $26; concrete masonry "B," (a) 12.60; (b) $11; concrete masonry "C," (a) $11.50; (b) $12. For both sewers, six-inch pipe for drain, (a) 30 cts.; (b) 30 cts. Bids were received June 18 for constructing a sewer as follows: Cranford Paving Co., 26th and E sts., N. W., Washington, Section A, tunnel excavation, $6.40 per cu. yd.; sewer brick masonry, $19.50; vitrified brick masonry, $24; concrete masonry "B," $9.50; concrete masonry "D," $9. Section B, ordinary excavation, 95 cts.; sewer brick masonry, $16.50; vitrified brick masonry, $21; concrete masonry "B," $8.20; rock excavation, $1.90 embankment, 30 cts.

WATER WORKS.

Columbia, S. C.—The new waterworks plant was officially accepted June 11.

New York City—The construction of the aqueduct which is to supply this city with water from the Catskill mountain region was begun June 20, at Peekskill.

Bellefontaine, O.—The weir at Lewistown reservoir gave way June 24 and the water from the reservoir escaped from a hole 30-ft. wide, causing the Miami river to overflow its banks and devastate farm lands.

Trenton, N. J.—Governor Stokes will name five members of the State Potable Water Commission, under the Hillery act, which became a law June 17. The ostensible object of the new law is to conserve the potable waters of the State for the use of the municipalities.

Newly incorporated water companies:

Nashville, Tenn.—Trezevant Waterworks Co.—R. L. Arga, H. Smith, C. M. Woods, B. H. Hillsman, W. F. Holt.

Laurel Springs, N. Y.—Laurel Springs Water Supply Co., Clementon twp.—Ellis Parker, Joseph J. Eldredge, Wm. McCully.

Beach Park, Lorain Co., O.—Lake Erie Water Co.—Geo. C. Ford, Gehard M. Dahl, Geo. H. Kelly, M. G. Alaman, C. G. Easty.

CONTEMPLATED WORK.

Moorhead, Minn.—Voted to construct water-works.

Denison, Tex.—A water-works system is proposed.

Cameron, Tex.—A water-works plant is proposed.

Almena, Kas.—A water-works system is contemplated.

Lawton, Ok.—Voted to issue bonds for constructing water-works.

St. Joseph, Minn.—Voted to construct a water-works system.

Honeoye Falls, N. Y.—A water-works system is contemplated.

Exeter, Neb.—Plans for a waterworks system have been prepared.

Graham, Tex.—Voted to issue bonds for constructing water-works.

Minot, N. D.—Plans are being prepared for water mains extensions.

Seneca, Ill.—The construction of water-works this year is contemplated.

Mountain View, Ok.—The construction of a water-works system is proposed.

Milton, Wash.—The construction of a water-works system is contemplated.

Hartley, Ia.—The improvement of the water-works system is contemplated.

Sidney, N. Y.—Estimates are being prepared for constructing water-works.

Medford, Wis.—Will vote on the issue of bonds for a water-works system.

Stambaugh, Mich.—This village contemplates the construction of water-works.

Gay Mills, Wis.—Plans are being considered for installing a water-works system.

Wrentham, Mass.—Voted to construct municipal water-works and electric plants.

Aurora, Ill.—The purchase of a new air compressor is contemplated. Ald. Stoll.

Shelby, N. C.—Surveys are being made for the construction of a water-works system.

Bedford, Mass.—City has made an appropriation of $5,000 for constructing water-works.

Tarentum, Pa.—The contract for a filtration plant will be awarded soon. Tarentum Water Co.

Clarendon, Ark.—The construction of a water-works system is contemplated. Mayor Jackson.

Graham, Tex.—Voted to issue bonds for installing a pumping station and stand pipe at once.

Los Angeles, Cal.—Voted to issue $23,000,000 bonds for constructing a municipal water system.

Wilson, N. C.—R. J. Grantham desires to communicate with companies installing filter plants.

Bryant, S. D.—The question of constructing water-works and sewerage systems is being considered.

Bryson City, N. C.—Voted to issue $20,000 bonds for establishing water-works. L. B. Marr, mayor.

Bottineau, N. D.—Voted to issue bonds for bringing a water supply from the mountains, 3-mis. distant.

Chattanooga, Tenn.—Voted, June 19, to issue $900,000 bonds for purchasing or building a water-works plant.

Lena, Ill.—The village trustees have decided to issue $5,000 bonds for improving the water-works pumping plant.

Morenci, Mich.—The Governor has signed a bill authorizing this city to issue bonds for constructing water-works.

Sherrard, Ill.—Bids are desired for constructing 4-in. water mains in sundry streets. C. E. Peterson, vil. clk.

Ashtabula, O.—The construction of water mains is contemplated in Bank, Sherman, Division, Tyler, Maple and Walnut sts.

Waukegan, Ill.—Plans are being prepared for the construction of water mains on a number of streets. M. R. Miller, cy. engr.

Poughkeepsie, N. Y.—Plans for a sedimentation basin to be constructed for the water system are being prepared. T. T. Whalen, cy. clk.

Marion, Kas.—Special. Voted, June 20, to issue $33,000 bonds for the purpose of installing a water-works plant. Thos. W. Brown, cy. clk.

Redkey, Ind.—Bids will probably be asked for soon for constructing a water-works and electric light plant. Earle Coble, chairman financial com.

Covington, Ga.—T. L. Wolfe and J. C. Cook, of Atlanta, Ga., have been engaged to make surveys and furnish plans for the construction of water-works system.

Aspinwall, Pa.—The addition of 40 more filter beds to the filtration plant now under construction on the Allegheny river is proposed. Geo. W. Guthrie, mayor Pittsburg.

Niagara Falls, N. Y.—W. W. Read, cy. engr. presented an outline of a plant to the bd. of pub. wks., June 18, for securing a pure water supply for this city. Mayor Douglas.

Louisville, Ky.—Charles Hermany, ch. engr., is preparing specifications for the establishment of a new engine at the pumping station on the river, at a cost of $300,000 to $400,000.

Athens, O.—Special. A. R. Bell, supt. Athens City W. W. says this city contemplates putting an extension on its standpipe, and desires the names and addresses of a few good manufacturers of steel towers, etc.

Brooklyn, N. Y.—Plans for extensive improvements to the water supply of this borough have been completed by Wm. C. Crozer, deputy commissioner of water supply, gas and electricity, and the bd. of estimate will be asked to appropriate $1,600,000 for the work.

CONTRACTS TO BE LET

Owosso, Mich.—Bids are asked until July 5 for sinking wells. Bd. pub. wks.

Eunice, La.—Bids are asked until July 15 for constructing a water-works system. O. E. Vidrine, mayor.

Kenmare, N. D.—Bids are asked until July 15 for laying 1,125-ft. of 4-in. mains. A. G. Engdahl, cy. audt.

Comfrey, Minn.—Bids are asked until July 16 for constructing a water-works system. W. B. Brooks, cy. recdr.

Jackson, Mo.—Bids are asked until July 9 for installing a water and light plant. Wm. Paar, cy clk.

Hastings, Minn.—Bids are asked until July 8 for constructing water mains and sewers. Chas. Hankes, cy. clk.

Highmore, S. D.—Bids are asked until July 8 for equipping a well at State Experimental Farm. E. C. Ericson, Vermillion.

Norwood, O.—Sealed bids are asked until July 6 for extending water mains in certain streets. L. H. Gobhart, clk. B. P. S.

Pawhuska, Ok.—Bids are asked until July 8 for engineering work for a sewer and water-works system. C. T. Bennett, cy. clk.

Sacramento, Cal.—Sealed bids are asked until Aug. 19 for constructing a filtration plant. M. J. Dasmond, clk. bd. trustees.

Monticello, Ill.—Bids are asked until July 6 for cleaning and repairing open ditch of sub-district No. 10. Harvey Fay, co. clk.

North Battleford, Sask.—Sealed bids are asked until July 31 for installing water-works, sewerage and electric light systems. S. Cookson, secy-treas.

Grand Island, Neb.—Sealed bids are asked until July 7 for constructing 7 blocks of c. i. water pipe on W. 5th st. with hydrants, gate valves, etc. H. E. Clifford, cy. clk.

New York City.—Bids are asked until July 3 for furnishing and delivering c. i. pipe, special castings and double nozzle hydrants. John H. O'Brien, comr. water supply.

Sayre, Ok.—Bids are asked until July 16 for constructing water-works, with hydrants, valves, power plant pumping

machinery, steel tower and tank. R. A. Troxel, cy. clk.

Arcola, Ill.—Sealed bids are asked until July 12 for constructing a water tower and tank, and wrecking the present plant, which consists of a brick and steel tank. Dr. E. S. Allen, chrm. com.

Fort Collins, Colo.—Sealed bids are asked until July 8 for constructing a rubble concrete dam across the North Fork of Cache La Poudre river near Livermore, requiring 17,500-cu. yds. of rubble concrete construction, 5000-cu. yds. earth and loose rock, and 500-cu. yds. excavation in solid rock. North Poudre Irrigation Co., M. E. Kaufman, secy.

Columbus, O.—Sealed bids are asked until July 10 for laying c. i. force mains, consisting of 18,100-cu. yds. of excavation, 12,200-cu. yds. embankment, 2,200-cu. yds. macadam, 495-cu. yds. brick and concrete masonry, 2,554-ft. c. i. pipe and special castings, 26-in. to 36-in. gate valves and 21,000-lbs. miscellaneous iron and steel. Henry Maetzel, ch. engr.

CONTRACTS AWARDED.

Trezavant, Tenn.—J. L. Richards has been awarded the contract for installing a water-works system.

Wetaskiwin, Alta.—The contract for constructing a steel tank was awarded to the Ontario Wind Engine & Pump Co., Ltd.

New Holland, Ill.—The contract for constructing a water-works system has been awarded to the Harris Air Pump Co., of Indianapolis, for $3,396.

West Branch, Ia.—The contract for constructing a water-works plant was awarded to Turner & Rowland, of Des Moines, for $15,000.

Bristol, Tenn.—The contract for furnishing water mains was awarded to the American Pipe Co., of Birmingham, Ala., at $31.90 per ton.

Trenton, N. J.—Wm. R. Throop was awarded the contract for erecting a new standpipe and high power pumping station at the reservoir, for $12,122.

South Milwaukee, Wis.—The contract for laying 900-ft. of intake pipe to connect with crib pipe line in Lake Michigan was awarded to M. O. Cluchey, of Ludington, Mich., for $3,600.

BRIDGES.

Woodland, Cal.—A reinforced concrete bridge over Putah creek is contemplated.

Indianapolis, Ind.—Bids are asked until July 12 for constructing three concrete bridges. Co. comrs.

Detroit, Mich.—Plans for 12 viaducts will be prepared at once by cy. engr. McCormick.

Pendleton, Ore.—Bids are asked until July 10 for constructing 2 new steel bridges. Co. comrs.

Morgantown, W. Va.—Voted to issue bonds for constructing a new bridge across Monongahela river.

Fargo, N. D.—Bids are asked until July 9 for constructing a number of bridges. Arthur G. Lewis, co. audt.

Culpeper, Va.—Bids are asked until July 20 for constructing 2 steel bridges. W. E. Coons. clk. co. comrs.

Rathdrum, Idaho.—Bids are asked until July 8 for building a bridge across Moore creek. Ignatz Weil, co. clk.

Cleveland, O.—Bids are asked until July 13 for constructing bridge work in Independent twp. A. B. Lea, co. surv.

New Orleans, La.—Bids are asked until July 15 for erecting a bascule or lift bridge. Chas. R. Kennedy, comptr.

Memphis, Tenn.—Cy. engr. Omberg has plans for a new bridge to span the Bayou Gayoso on Madison ave., east of 4th st.

Toledo, O.—Bids are asked until July 10 for constructing a concrete arch bridge at Cherry st. Reynold Voit, secy. B. P. S.

Hagerman, N. Mex.—Bids are asked until July 8 for erecting a metal and concrete bridge over Pecos river. W. M. Atkinson, Chrm. co. comr.

San Juan, Porto Rico.—Bids are asked until July 20 for plans for 5 steel riveted truss highway bridge spans. J. J. Jiminez, supt. pub. wks.

Toronto, Ont.—Bids are asked until July 16 for building steel railway bridges and handrailing for Lansdowne ave. subway. C. H. Rust, cy. engr.

Beatrice, Neb.—Sealed bids are asked until July 9 for constructing a reinforced concrete bridge 2½-mis. east of this city. B. H. Conlee, co. clk.

Nashville, Tenn.—Bids are asked until July 10 for constructing concrete piers for 2 highway bridges. Jas. K. Raines, chmn. Cumberland River Bridge com.

Milwaukee, Wis.—Council committee on bridges and viaducts has recommended the construction of a concrete bridge across Kinnickinnic river at 7th st.

North Hempstead, L. I., N. Y.—Bids are asked until 3:30 p. m., July 2, for constructing 2 steel and concrete bridges at Plandome Mills near Manhasset. Town bd.

Fort Snelling, Minn.—Bids are asked until July 19 for constructing a bridge across Mississippi river here. Col. Jas. B. Quinn, U. S. Engr., P. O. Box 654, St. Paul.

Enterprise, O.—Bids are asked until July 6 for constructing a steel superstructure across Hocking river, at Logan-Lancaster road, Falls twp. Jas. L. Maryin, co. audt.

Nashville, Tenn.—Bids are asked until July 10 for building concrete piers, 2 bridges, 2 reinforced concrete viaduct approaches, etc. Howard M. Jones, co. engr.

Brookhaven, Miss.—Plans have been adopted by the bd. of supervisors for a steel bridge across Bogue Chitto river, at Norfield, and the contract will be let in July.

Connersville, Ind.—Sealed bids are asked until July 5 for constructing 2 steel beam and concrete floor bridges, 20 and 36-ft. span, and 3 bridge floors, steel beams and concrete, one 45-ft. span. K. L. Hanson, co. surv.

Cincinnati, O.—Sealed bids are asked until July 12 for constructing a concrete box culvert on Compton road; a reinforced concrete bridge and approaches on Ohio Pike, at Ferris's; improving culvert on Cleves and Bridgetown Pike, near Balzer's. Stanley Struble, pres. co. comrs.

STREET LIGHTING.

Scottsboro, Ala.—An electric light plant is proposed.

Paulsboro, N. J.—Voted to issue bonds for a gas plant.

Hereford, Tex.—An electric light and gas plant is contemplated.

Hancock, Mich.—Plans are being made for a municipal electric light plant.

Morristown, N. J.—The estimated cost of an electric light plant is $200,000.

Ozark, Ark.—The citizens are in favor of a municipal electric light plant.

Redkey, Ind.—Bids will probably be asked soon for installing an electric light plant.

Wrentham, Mass.—The citizens favor the construction of a municipal electric light plant.

Marshall, Minn.—Voted to issue bonds to repair and enlarge the municipal electric light plant.

Holland, Mich.—Voted to issue bonds for doubling the capacity of the municipal electric light plant.

Jackson, Mo.—Sealed bids are asked until July 9 for installing an electric light plant. Wm. Paar, cy. clk.

Bradford, Pa.—Bids are asked until July 15 for 141 (minimum) all night street lights. Edward C. Charlton, cy. clk.

Arlington, O.—Bids are asked until July 9 for constructing an electric light plant. Geo. Champe, 619 The Nasby, Toledo.

Blakely, Pa.—Plans are being prepared for increasing the capacity of the municipal lighting plant. J. N. Green, mgr.

Marquette, Mich.—The Governor has signed a bill authorizing this city to issue bonds for a municipal electric light plant.

Bunker Hill, Ill.—Plans are being made for increasing the capacity of the municipal electric light plant. W. H. Coffee, supt.

North Battleford, Sask.—Sealed bids are asked until July 31 for installing an electric light plant. S. Cookson, secy.-treas.

Brookline, Mass.—Henry Howard and Philip F. Parker have been appointed a committee to secure estimates on the cost of a municipal lighting plant.

Youngstown, O.—The committee of city council on a municipal lighting plant has decided to report favorably on the proposition of a municipal light plant.

Ocala, Fla.—The question of installing an engine, boiler and generator in the municipal electric light plant is under consideration. E. C. Bennett, supt.

Georgetown, O.—Bids are asked until July 13 for boiler, brick or concrete chimney, arc and commercial pole line, arc lamps, switchboard, transformers, etc., for the electric light plant now running. W. A. Eyler, clk. bd. trustees of pub. affairs.

Winnipeg, Man.—Sealed bids are asked until Sept. 3 for constructing general works and for the supply and erection of the various portions of the equipment for the Hydro-Electric Works and Station at Point du Bois, for a transmission line between Point du Bois and Winnipeg. M. Peterson, secy. bd. control.

PARKS.

Prescott, Ark.—The women of this city are raising funds for establishing an 8-acre park.

Fergus Falls, Minn.—The park board has engaged F. Nussbamer, of St. Paul, to suggest improvements in the park system.

Moline, Ill.—Plans for the improvement of Sylvan Park along the river front are being prepared by Clark Anderson, cy. engr.

Spokane, Wash.—A tract of 10 acres has been offered to the park board as an addition to Lidgerwood Park on condition that the city expend not less than $10,000 in improving it.

Lamberton, Minn.—The citizens of this city recently combined their forces for the purpose of grading and laying out walks for the village park, and generally improving the park.

Moncton, N. B.—City council has decided to purchase a tract in the east end of this city fronting on the river to be known as Bore Park. The city will also purchase the Spurr property in the center of town for a public park.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

White Plains, N. Y.—A garbage incinerating plant is contemplated.

Ft. Myer, Va.—Bids are asked until July 17 for constructing a garbage crematory. Capt. B. B. Hyer, Q. M., U. S. A.

Elizabeth, N. J.—The contract for removing ashes, garbage and offal for 3-yrs. was awarded to Nicola LaCorta, 621 3d ave., this city, for $34,800.

Jersey City, N. J.—A resolution has been adopted authorizing C. H. Van Keuren to prepare specifications for the removal of garbage and ashes for 1 or 5-yrs.

Washington, D. C.—The contract for the collection and disposal of miscellaneous refuse was awarded to Isaac T. Brown, for 2-yrs. and 11-mo., for $16,000.

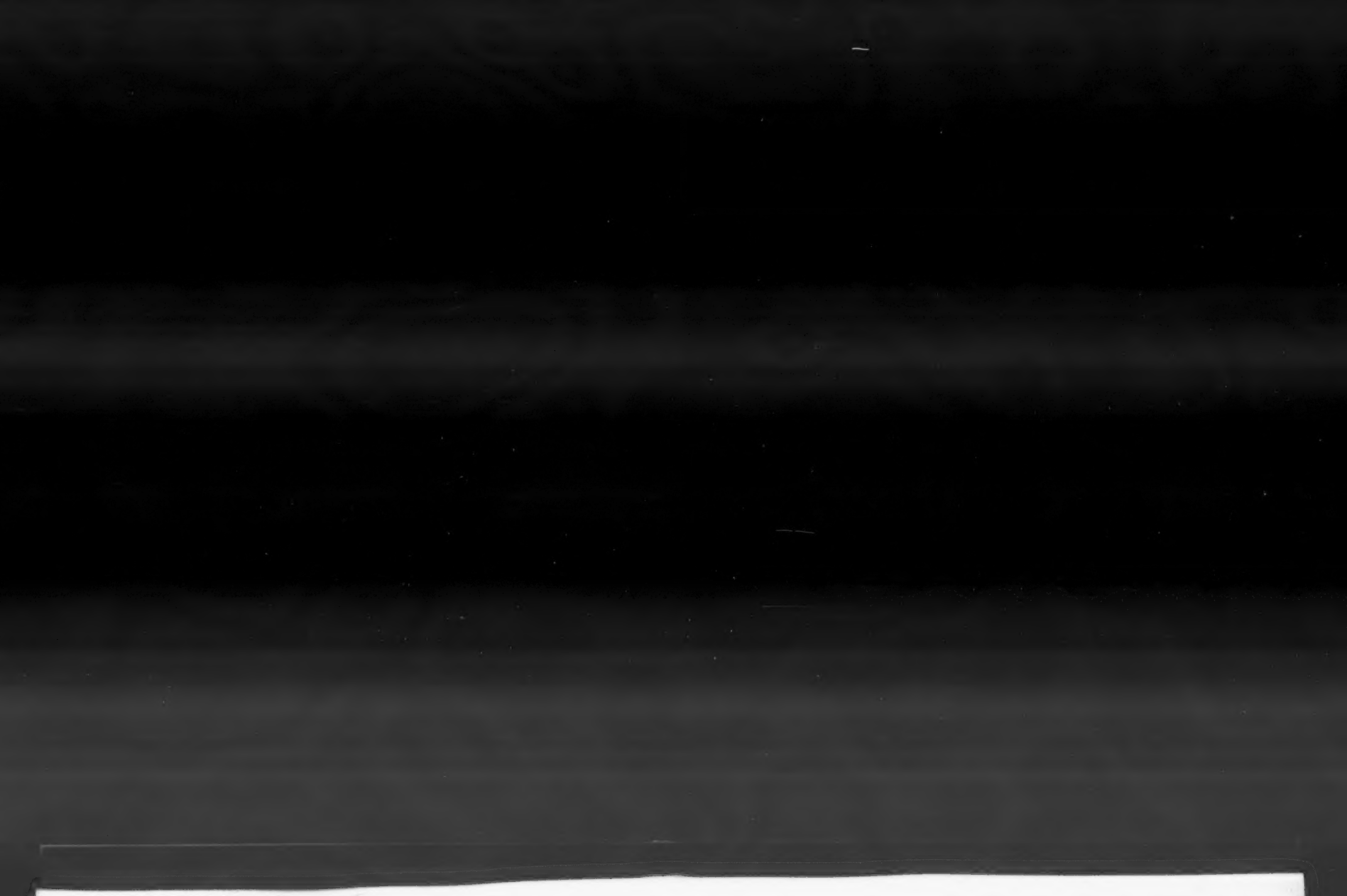
Columbus, O.—The directors of the bd. of pub. service decided, June 11, to adopt reduction as the method for disposal, and incineration to dispose of rubbish.

Milwaukee, Wis.—Rudolph Hering, of New York City, who has been engaged to furnish plans for a new garbage plant arrived in this city June 16 to take a general view of the situation.

FIRE APPARATUS.

Perry, Ia.—The fire department wants a chemical wagon.

New Prague, Minn.—Council will purchase a fire extinguisher.

Waupaca, Wis.—Council voted $750 for the purchase of a hook and ladder wagon.

Kalamazoo, Mich.—Bids are asked until July 5 for erecting a central fire station. J. Wesley Bean, secy. bd. police and fire comrs.